Draft Water Resources Management Plan 2024

Technical Appendix AA – Biodiversity Net Gain and Natural Capital Assessment

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1 Introduction

1.1 Background

Thames Water is the UK's largest water and wastewater services company, and it supplies 2.6 billion litres of drinking water per day and treats 4.7 billion litres of wastewater per day. It is responsible for the public water supply and wastewater treatment for most of Greater London, Luton, the Thames Valley, Surrey, Gloucestershire, north Wiltshire, and far west Kent. The area covered by Thames Water has a population of 15 million, that comprise 27% of the UK population.

This Annex presents the Natural Capital Assessment (NCA) and Biodiversity Net Gain (BNG) assessment that has been undertaken as part of the environmental assessment process to support development of the Thames Water Resources Management Plan (WRMP).

Thames Water WRMP

All of Thames Water's operations sit within the Water Resources South East (WRSE) region. To support a robust evaluation of alternatives, WRSE ran the investment model multiple times to examine how the investment plan changed as the inputs to the values used in the adaptive framework changed. The options selected are those from Situation 4 which are anticipated to have begun construction by 2050. At a WRSE level three alternative programmes were selected for consideration / assessment through the Strategic Environmental Assessment (SEA) process, which the NCA and BNG assessment form a part of. These programmes are set out below along with a justification for why they were progressed:

- Least Cost Plan –- The Water Resources Planning Guideline[1] (the 'Guidelines') state in Section 10.4 that:
  '*You should produce a least cost programme as a benchmark to appraise your other programmes against. The least cost plan should meet your statutory requirements and be informed by your SEA and HRA. The least cost plan should include policy expectations around demand management*.'
  This programme meets all of the legal/ regulatory requirements, policy expectations and objectives of the plan. It is therefore a reasonable alternative and was progressed for consideration through the SEA process.

- Best Environmental and Societal Plan –- The Guidelines state in Section 10.3 that:
  'You should present in your WRMP a programme that represents a 'Best Environment and society' programme in your programme appraisal. The 'best environment and society' programme should be one that is formed using this guidance and therefore takes into account the Strategic Environmental Assessment, Habitats Regulations Assessment, Biodiversity Net Gain and Natural Capital where appropriate…You should explain in your plan how you have considered your Best Environment programme, as part of your programme appraisal, and what influence it has had on your preferred programme'.

[1] Environment Agency, Natural Resources Wales, The Water Services Regulation Authority (2022). Water Resources Planning Guideline. Available at:
Water resources planning guideline - GOV.UK (www.gov.uk)

This programme meets all the legal / regulatory requirements, policy expectations and objectives of the plan. It is therefore a reasonable alternative and was progressed for consideration through the SEA process.

- Best Value Plan (BVP) – The Guidelines state in Section 9.1 that:
  '*The aim of the regional plan and the WRMP is to present a best value plan*.'
  This programme meets all the legal / regulatory requirements, policy expectations and objectives of the plan. It is therefore a reasonable alternative and was progressed for consideration through the SEA process.

Further information on the description and context for the WRMP can be found in Appendix B - Thames Water WRMP Strategic Environmental Assessment Report.

Natural Capital

Natural capital refers to the elements of the natural world that provide benefits to society and includes aspects such as woodland, grassland, freshwater, marine, urban greenspace and wetland habitats. The benefits that are provided vary from regulating services such as natural flood management to cultural services such as recreational value.

Biodiversity Net Gain

BNG refers specifically to the combination of habitats present within a site and their ability to support biodiversity, summarised by a quantifiable score and a percentage change following changes in habitat. Each habitat is given a distinct score that relates to its area, condition, distinctiveness and connectivity. The change in habitat due to the construction and operation of the regional plan options informs the overall BNG score and whether they are likely to contribute to a net gain in biodiversity. The Environment Act 2021[2] has now specified a requirement for development to demonstrate a 10% BNG.

Environmental Net Gain

Environmental net gain is an approach to development that aims to leave the natural environment in a measurably better state than before the plan or scheme is implemented. There is currently no defined methodology for the incorporation of environmental net gain within regional water planning guidance. However, in line with the Guidelines, the emerging regional plan's environmental net gain will align with HM Government's 25 Year Environment Plan[3] commitments and targets by:

- Conserving and enhancing Sites of Special Scientific Interest (SSSIs) (Wildlife and Countryside Act (1981)[4] as amended.
- Furthering the purpose of the Habitats Directive (and Regulations) Conservation of Habitats and Species Regulations (2017)[5] as amended.

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[2] Environment Act 2021. legislation.gov.uk. Available at: https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted

[3] DEFRA (2018). 25 Year Environment Plan. Available at: 25 Year Environment Plan - GOV.UK (www.gov.uk)

[4] Wildlife and Countryside Act 1981. Legislation.gov.uk. Available at: Wildlife and Countryside Act 1981 (legislation.gov.uk)

[5] The Conservation of Habitats and Species Regulations 2017 (legislation.gov.uk)

- BNG for habitats and species of principal importance for the conservation of biodiversity – (Natural Environment and Rural Communities Act (2006)[6].

The Thames Water WRMP will aim to demonstrate whether it has achieved environmental net gain through the individual assessment such as BNG and wider environmental gains quantified through the NCA.

1.2 Thames Water WRMP24 Options

Throughout the period Thames Water have been developing their plan, there have been developments and updates to various options, as part of an iterative options appraisal process. Within this period, there have been updates to the Enabling a Natural Capital Approach (ENCA) guidance (August 2021) and Department of Environment, Food and Rural Affairs (Defra) BNG metric[7], based on feedback and literature, the assessments have been updated to reflect these changes. The August 2021 ENCA guidance includes updated values within the Asset Databook and Service Databook. Within the Service Databook, the carbon reduction tab now includes the Department of Business, Energy and Industrial Strategy (BEIS) (2022) carbon values - a set of values produced by the government to be used in policy appraisal and evaluation, reflecting the latest evidence.

When running the investment model, whereby assessment occurs on a comparative basis, the same version of the natural capital and BNG guidance was used for consistency. Upon reporting the impacts of the options selected in the final run of the plans, different options have used different guidance. As in this activity options are not being compared, and are instead assessing impact, the use of multiple versions of the guidance has been deemed acceptable. As a result, Table 1.1, Table 1.3, and Table 1.5 below have identified what version of guidance has been used.

The Post-2021 version of the guidance was used for options that were selected in WRSE's Emerging regional plan; assessments remained using the Pre-2021 version for options selected in WRSE's draft Best Value regional plan that had not been selected in the Emerging plan. Assessments will be updated to match the latest available guidance in the next iteration of the plan.

It is important to note that the Thames Water area includes a number of Strategic Resource Options (SROs) which are significant strategic options spanning across water companies. Throughout the period Thames Water have been developing their plan, these options have continued to be developed as part of the Regulators' Alliance for Progressing Infrastructure Development (RAPID) gated process. The environmental results used to originally inform the regional investment modelling have been reported below. At the time of writing, the SRO designs and associated environmental assessments are continuing to be developed for Gate 2 of the RAPID gated process and may be subject to further change prior to Gate 2 publication.

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[6]Natural Environment and Rural Communities Act 2006. Legislation.gov.uk. Available at: Natural Environment and Rural Communities Act 2006 (legislation.gov.uk)

[7] Natural England, DEFRA (2021). Biodiversity 3.0 metric launched in new sustainable development toolkit. Available at: https://www.gov.uk/government/news/biodiversity-30-metric-launched-in-new-sustainable-development-toolkit

Least Cost Plan

The Least Cost Plan includes 18 supply-side options scoped in as requiring BNG and NCA, including the associated SROs. The options and associated option descriptions are presented in Table 1.1 below.

Please note, assessments scoped in for BNG and NCA are identical for the Least Cost Plan and Best Environmental and Societal Plan. However, the report does not assess the full list of options associated with each plan, for example, the assessment excludes those options selected post-2050, which may further differentiate the plans.

Table 1.1 Options and descriptions scoped into the Least Cost plan (SROs demarked with an asterisk)

Option ID	Option Name	Description	Guidance used
TWU_GUI_HI-TFR_RZ5_ALL_sewtogui	South East Water to Guildford	10Ml/d transfer from South East Water (Hogsback) to Mount SR Guildford	Pre-2021 update
TWU_KGV_HI-TFR_TED_ALL_teddingtondrated/tlt*	Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD	Raw water abstraction at Teddington to Thames Lee Tunnel (Teddington DRA)(London Reuse SRO)	Pre-2021 update
TWU_KVZ_HI-TFR_T2S_ALL_t2st cul to speen*	T2ST Culham to Speen transfer	T2ST Culham to Speen transfer 10Ml/d spur connection from T2ST to Speen WTW, potable (Thames to Southern Transfer (T2ST) SRO)	Pre-2021 update
TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney	River Thames to Fobney Transfer	Transfer from River Thames to Fobney, to supply 40Ml/d to Kennet Valley. Existing treatment facilities available at Fobney	Post-2021 update
TWU_LON_HI-GRW_ALL_ALL_s'fleetlic disagg	Southfleet/Greenhithe (new WTW)	Southfleet licence disaggregation	Post-2021 update
TWU_LON_HI-GRW_RE1_ALL_asrhortonkirby	ASR Horton Kirby	Construction of pipelines between two existing ASR boreholes in the Lower Greensand aquifer to an existing WTW at Horton Kirby in Kent. Water abstracted from existing Chalk aquifer boreholes (via the mains supply) will be recharged into the two ASR boreholes during	Post-2021 update

Option ID	Option Name	Description	Guidance used
		periods of water surplus and abstracted when needed and treated at the WTW. A new licence and discharge consent will be required from the Environment Agency to allow abstraction/ recharge from the Lower Greensand aquifer	
TWU_LON_HI-ROC_WT1_CNO_kemptonwtw150	Kempton - 150 - Construction	Phase 1 Construction of new water treatment of 150 Ml/d capacity within the Kempton WTW land boundary on land owned by Thames Water. The new treatment capacity will be used to supply the London water resource zone	Pre-2021 update
TWU_STR_HI-RSR_RE1_CNO_abingdon150(lon)*	New Reservoir Abingdon 150 Mm3 - 283 MLD (Lon only) - Construction	New non-impounding bunded reservoir situated within Oxfordshire, 5km southwest of Abingdon with a volume of 150Mm³(South East Strategic Reservoir Option (SESRO) SRO)	Pre-2021 update
TWU_STT_HI-REU_RE1_ALL_p5-300-neth_p35*	Netheridge STW effluent diversion (35Mld) - Cotswold Canals	35 Ml/d – Netheridge Sewage Treatment Works (STW) source support element (Covered under STW Severn Trent Sources SRO developed by Severn Trent Water). Discharge location is the Gloucester Docks/ downstream on the Severn. Effluent diversion has the capacity to release 35Ml/d into the STT scheme. Difference between Element 5a and 5b relates to the length of discharge pipe only (Severn to Thames Transfer (STT) SRO)	Pre-2021 update

Option ID	Option Name	Description	Guidance used
TWU_SWA_HI-TFR_HEN_ALL_henley-swa5	Henley to SWA – 5 Ml/d	Transfer 5Ml/d from Sheeplands WTW to Hambledon WTW	Pre-2021 update
TWU_SWX_HI-GRW_ALL_ALL_woods farm do	Woods Farm Increase DO	New borehole to be constructed on site to bring DO up to licence (this is an additional 2.4 Ml/d to average licence of 4.99 Ml/d or an additional 2.91 Ml/d to peak licence of 5.5 Ml/d). Currently the site is only able to produce up to 2.59 Ml/d constrained by turbidity. Woods Farm WRMP24 option comprises: - Retaining the current abstraction licence with construction of a new abstraction borehole in the unconfined Chalk, 1.4 km east of the existing Woods Farm boreholes - The option also includes a new 1.4 km raw water pipeline from the new satellite borehole to Woods Farm WTW	Pre-2021 update
TWU_SWX_HI-IMP_SWX_ALL_wessextoswoxflax	Wessex Water to SWOX (Flaxlands)	Transfer 2.9 Ml/d from Wessex Water to Flaxlands. One new main from Minety SR (Wessex) to Flaxlands SR (TW). Also included is the transfer main from Charlton WTW to Minety SR	Post-2021 update
TWU_SWX_HI-IMP_SWX_CNO_oxc-dukes cutswox	Oxford Canal - BCN Surplus – Raw Water Transfer Resource (Duke's Cut)	This element includes upgrades to the canal network to transfer 15 Ml/d surplus from the Wolverhampton Levels to upstream of Duke's Cut	Pre-2021 update
TWU_SWX_HI-ROC_WT1_CNO_abingdon wtw ph1	Abingdon WTW Ph1 - Construction	24 MLD Treatment works for reservoir water in Abingdon (SWOX) and for transfer to SWA. Purpose is to accommodate	Pre-2021 update

Option ID	Option Name	Description	Guidance used
		additional future demand	
TWU_SWX_HI-TFR_STR_ALL_abing-farmoor pipe	Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR)	Construction of a transfer pipeline to convey 24 Ml/d of raw water between a proposed reservoir at Abingdon and the existing Farmoor reservoir, in the SWOX WRZ	Pre-2021 update
TWU_SWX_HI-TFR_SWX_ALL_dukes cut-farmoor	Dukes Cut to Farmoor	15 Ml/d conveyance option from the Oxford Canal to Farmoor Reservoir, with abstraction from a point approximately 800m north of Dukes Cut on the Oxford Canal, discharging into the River Thames for subsequent re-abstraction at the existing Farmoor Reservoir intake. Resource to be provided by CRT - refer to separate F909 (RES-RWTS-OXC-DKC-15) for resource costs. This scheme has been developed with the following assumptions: It has been assumed that, as the transfer will only be used in periods of low flow, no works will be required to upgrade the existing intake structure at Farmoor Reservoir. It has been assumed that, as the transfer will only be used in periods of low flow, no works will be required to upgrade the existing treatment facilities at Farmoor Reservoir	Pre-2021 update
TWU_TED_HI-TFR_TED_ALL_teddingtondramog/ted*	Mogden to Teddington outfall 75 Ml/d	Conveyance from Mogden to the River Thames at Teddington (Teddington DRA)(London Reuse SRO)	Pre-2021 update

Option ID	Option Name	Description	Guidance used
TWU_U7T_HI-RAB_RE1_ALL_p1-300-unsupported*	Pipeline conveyance, Deerhurst to Culham (300Mld)	300 Ml/d - Pipeline and associated infrastructure (including pump station, treatment plant, break pressure tank) with design capacity of 300 Ml/d to convey raw water from River Severn to River Thames. Pipeline is the same for 300/400/500 but infrastructure site extents are different (STT SRO)	Pre-2021 update

A total of 16 options within the Least Cost Plan were scoped out of NCA and BNG assessments. Table 1.2 below outlines the scoped-out options along with the reasoning for being scoped out.

Table 1.2: Summary of scoped out options

Option ID	Option Name	Reason for scoping out
TWU_GUI_HI-GRW_ALL_ALL_dapdune lic disagg	Dapdune Licence Disaggregation	Further NCA and BNG Assessment has been scoped out due to the option type and available option information. The option is not expected to generate any land use change or direct impacts on natural capital. Any additional impacts within the option Zone of Influence (ZoI)** will be captured within the SEA, WFD & resilience assessment.
TWU_HEN_EF-TFR_REP_ALL_tw(kv)to(hen)res	Thames Water (Henley) to Thames Water (Kennet Valley) Resource	Further NCA and BNG Assessment has been scoped out due to the current available option information. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment.
TWU_HEN_HI-TFR_KVZ_ALL_tw(kv)to(hen)con	Thames Water (Henley) to Thames Water (Kennet Valley) Conveyance	Further NCA and BNG Assessment has been scoped out due to the current available option information. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment.
TWU_KEM_EF-TFR_RE1_ALL_tedd-kempton res*	Teddington to Kempton (displacement of water) resource (London Reuse SRO)	Modelling purposes only no assessments needed.
TWU_KEM_HI-TFR_TED_ALL_tedd-kempton*	Teddington to Kempton (displacement of water)(London Reuse SRO)	Modelling purposes only no assessments needed.

Option ID	Option Name	Reason for scoping out
TWU_KGV_HI-TFR_KGV_ALL_lockwood ps-kgv res*	TLT extension from Lockwood PS to King George V Reservoir intake (London Reuse SRO)	Modelling purposes only no assessments needed.
TWU_KVZ_HI-GRW_ALL_ALL_mortimer recomm	Mortimer Disused Source (Recommission)	Further NCA and BNG Assessment has been scoped out due to the option type and available option information. The option is not expected to generate any land use change or direct impacts on natural capital. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment
TWU_LON_HI-GRW_ALL_ALL_addington gw	Groundwater Addington	Further NCA and BNG Assessment has been scoped out due to the option type and available option information. The option is not expected to generate any land use change or direct impacts on natural capital. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment
TWU_LON_HI-ROC_NET_CNO_hampton-battersea	TWRM extension - Hampton to Battersea	Further NCA and BNG Assessment scoped out due to the option type and characteristics. The option footprint does not intersect any of high value stocks as it is expected to be contained within a tunnel below the surface. It is expected that the option will not lead to the loss of natural capital stocks or associated ecosystem services
TWU_LON_HI-ROC_WT1_ALL_eastlonwtwexisting	Expansion of existing East London WTW	NCA scoped out (existing asset)
TWU_LON_HI-ROC_WT1_ALL_existing w lon wtw	Expansion of existing West London WTW	NCA scoped out (existing asset)
TWU_SWA_HI-GRW_ALL_ALL_datchet do	Datchet Increase DO	Further NCA and BNG Assessment has been scoped out due to the option type and available option information. The option is not expected to generate any land use change or direct impacts on natural capital. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment
TWU_SWX_HI-GRW_ALL_ALL_moulsford gw	Moulsford 1	Further NCA and BNG Assessment scoped out due to

Option ID	Option Name	Reason for scoping out
		the option type and characteristics. The option footprint follows does not intersect any of high value stocks and only intersects with arable land. It is expected that the option will not lead to the loss of natural capital stocks or associated ecosystem services by following standard mitigation and any temporary impacts with not have an impact on ecosystem services
TWU_SWX_HI-GRW_RE1_ALL_britwell roc	Britwell Removal of Constraints	Further NCA and BNG Assessment scoped out due to the option type and location. The option footprint does not intersect any of high value stocks and consists of built up areas or farmland that would not be impacted by construction. It is expected that the option will not lead to the loss of natural capital stocks or associated ecosystem services
TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx)con	Thames Water (SWA) to Thames Water (SWOX) Conveyance	Further NCA and BNG Assessment has been scoped out due to the current available option information. The Option is an existing asset so no construction or operational impacts are expected. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment
TWU_TED_HI-RAB_RE1_CNO_teddington dra 75*	Teddington DRA 75 MLD – Construction (London Reuse SRO)	Further NCA and BNG Assessment scoped out due to the option footprint not including any natural capital Stocks
TWU_SWA_EF-TFR_REP_ALL_swoxexportn	SWOX SWA North Export	This is a resource element and doesn't have any metrics so no assessment

** The zone of influence (ZoI) for each option was defined as the area of receiving or providing environment with the potential to be altered or changed as a result of the option

Best Environmental and Societal Plan

The Best Environmental and Societal Plan includes 18 supply-side options scoped in as requiring BNG and NCA, including the associated SROs. The options and associated option descriptions are presented in Table 1.3 below.

Table 1.3: Options and descriptions scoped into the Best Environmental and Societal Plan (SROs demarked with an asterisk)

Option ID	Option Name	Description	Guidance used
TWU_GUI_HI-TFR_RZ5_ALL_sewtogui	South East Water to Guildford	10Ml/d transfer from South East Water	Pre-2021 update

Option ID	Option Name	Description	Guidance used
		(Hogsback) to Mount SR Guildford	
TWU_KGV_HI-TFR_TED_ALL_teddingtondrated/tlt*	Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD	Raw water abstraction at Teddington to Thames Lee Tunnel (Teddington DRA) (London Reuse SRO)	Pre-2021 update
TWU_KVZ_HI-TFR_T2S_ALL_t2st cul to speen*	T2ST Culham to Speen transfer	T2ST Culham to Speen transfer 10Ml/d spur connection from T2ST to Speen WTW, potable (T2ST SRO)	Pre-2021 update
TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney	River Thames to Fobney Transfer	Transfer from River Thames to Fobney, to supply 40Ml/d to Kennet Valley. Existing treatment facilities available at Fobney	Post-2021 update
TWU_LON_HI-GRW_ALL_ALL_s'fleet lic disagg	Southfleet/Greenhithe (new WTW)	Southfleet licence disaggregation	Post-2021 update
TWU_LON_HI-GRW_RE1_ALL_asrhortonkirby	ASR Horton Kirby	Construction of pipelines between two existing ASR boreholes in the Lower Greensand aquifer to an existing WTW at Horton Kirby in Kent. Water abstracted from existing Chalk aquifer boreholes (via the mains supply) will be recharged into the two ASR boreholes during periods of water surplus and abstracted when needed and treated at the WTW. A new licence and discharge consent will be required from the Environment Agency to allow abstraction /recharge from the Lower Greensand aquifer	Post-2021 update
TWU_LON_HI-ROC_WT1_CNO_kemptonwtw150	Kempton - 150 - Construction	Phase 1 Construction of new water treatment 150 Ml/d capacity within the Kempton WTW land boundary on land owned by Thames Water. The new treatment capacity will be used to supply the	Pre-2021 update

Option ID	Option Name	Description	Guidance used
		London water resource zone	
TWU_STR_HI-RSR_RE1_CNO_abingdon150(lon)*	New Reservoir Abingdon 150 Mm3 - 283 MLD (Lon only) - Construction	New non-impounding bunded reservoir situated within Oxfordshire, 5km southwest of Abingdon with a volume of 150Mm³ (SESRO SRO)	Pre-2021 update
TWU_STT_HI-REU_RE1_ALL_p5-300-neth_p35*	Netheridge STW effluent diversion (35Mld) - Cotswold Canals	35 Ml/d – Netheridge Sewage Treatment Works (STW) source support element (Covered under STW Severn Trent Sources SRO developed by STW). Discharge location is the Gloucester Docks/downstream on the Severn. Effluent diversion has the capacity to release 35Ml/d into the STT scheme. Difference between Element 5a and 5b relates to the length of discharge pipe only (STT SRO)	Pre-2021 update
TWU_SWA_HI-TFR_HEN_ALL_henley-swa5	Henley to SWA – 5 Ml/d	Transfer 5Ml/d from Sheeplands WTW to Hambledon WTW	Pre-2021 update
TWU_SWX_HI-GRW_ALL_ALL_woods farm do	Woods Farm Increase DO	New borehole to be constructed on site to bring DO up to licence (this is an additional 2.4 Ml/d to average licence of 4.99 Ml/d or an additional 2.91 Ml/d to peak licence of 5.5 Ml/d). Currently the site is only able to produce up to 2.59 Ml/d constrained by turbidity. Woods Farm WRMP24 option comprises: - Retaining the current abstraction licence with construction of a new abstraction borehole in the unconfined Chalk, 1.4 km east of the existing Woods Farm boreholes; - The option also includes a new 1.4 km	Pre-2021 update

Option ID	Option Name	Description	Guidance used
		raw water pipeline from the new satellite borehole to Woods Farm WTW	
TWU_SWX_HI-IMP_SWX_ALL_wessextoswoxflax	Wessex Water to SWOX (Flaxlands)	Transfer 2.9 Ml/d from Wessex Water to Flaxlands. One new main from Minety SR (Wessex) to Flaxlands SR (TW). Also included is the transfer main from Charlton WTW to Minety SR	Post-2021 update
TWU_SWX_HI-IMP_SWX_CNO_oxc-dukes cutswox	Oxford Canal - BCN Surplus – Raw Water Transfer Resource (Duke's Cut)	This element includes upgrades to the canal network to transfer 15 Ml/d surplus from the Wolverhampton Levels to upstream of Duke's Cut	Pre-2021 update
TWU_SWX_HI-ROC_WT1_CNO_abingdon wtw ph1	Abingdon WTW Ph1 - Construction	24 MLD Treatment works for reservoir water in Abingdon (SWOX) and for transfer to SWA. Purpose is to accommodate additional future demand	Pre-2021 update
TWU_SWX_HI-TFR_STR_ALL_abing-farmoor pipe	Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR)	Construction of a transfer pipeline to convey 24 Ml/d of raw water between a proposed reservoir at Abingdon and the existing Farmoor reservoir, in the SWOX WRZ	Pre-2021 update
TWU_SWX_HI-TFR_SWX_ALL_dukescut-farmoor	Dukes Cut to Farmoor	15 Ml/d conveyance option from the Oxford Canal to Farmoor Reservoir, with abstraction from a point approximately 800m north of Dukes Cut on the Oxford Canal, discharging into the River Thames for subsequent re-abstraction at the existing Farmoor Reservoir intake. Resource to be provided by CRT - refer to separate F909 (RES-RWTS-OXC-DKC-15) for resource costs. This	Pre-2021 update

Option ID	Option Name	Description	Guidance used
		scheme has been developed with the following assumptions: It has been assumed that, as the transfer will only be used in periods of low flow, no works will be required to upgrade the existing intake structure at Farmoor Reservoir. It has been assumed that, as the transfer will only be used in periods of low flow, no works will be required to upgrade the existing treatment facilities at Farmoor Reservoir	
TWU_TED_HI-TFR_TED_ALL_teddingtondramog/ted*	Mogden to Teddington outfall 75 Ml/d	Conveyance from Mogden to the River Thames at Teddington (Teddington DRA)(London Reuse SRO)	Pre-2021 update
TWU_U7T_HI-RAB_RE1_ALL_p1-300-unsupported*	Pipeline conveyance, Deerhurst to Culham (300Mld)	300 Ml/d - Pipeline and associated infrastructure (including pump station, treatment plant, break pressure tank) with design capacity of 300 Ml/d to convey raw water from River Severn to River Thames. Pipeline is the same for 300/400/500 but infrastructure site extents are different (STT SRO)	Pre-2021 update

A total of 16 options within the Best Environmental and Societal Plan were scoped out of NCA and BNG assessments. Table 1.4 below outlines the scoped-out options along with the reasoning.

Table 1.4: Summary of scoped out options

Option ID	Option Name	Reason for scoping out
TWU_GUI_HI-GRW_ALL_ALL_dapdune lic disagg	Dapdune Licence Disaggregation	Further NCA and BNG Assessment has been scoped out due to the option type and available option information. The option is not expected to generate any land use change or direct impacts on natural capital. Any additional impacts within the

Option ID	Option Name	Reason for scoping out
		option ZoI will be captured within the SEA, WFD & resilience assessment.
TWU_HEN_EF-TFR_REP_ALL_tw(kv)to(hen)res	Thames Water (Henley) to Thames Water (Kennet Valley) Resource	Further NCA and BNG Assessment has been scoped out due to the current available option information. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment.
TWU_HEN_HI-TFR_KVZ_ALL_tw(kv)to(hen)con	Thames Water (Henley) to Thames Water (Kennet Valley) Conveyance	Further NCA and BNG Assessment has been scoped out due to the current available option information. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment.
TWU_KEM_EF-TFR_RE1_ALL_tedd-kempton res*	Teddington to Kempton (displacement of water) resource (London Reuse SRO)	Modelling purposes only no assessments needed.
TWU_KEM_HI-TFR_TED_ALL_tedd-kempton*	Teddington to Kempton (displacement of water) London Reuse SRO)	Modelling purposes only no assessments needed.
TWU_KGV_HI-TFR_KGV_ALL_lockwood ps-kgv res*	TLT extension from Lockwood PS to King George V Reservoir intake (London Reuse SRO)	Modelling purposes only no assessments needed.
TWU_KVZ_HI-GRW_ALL_ALL_mortimer recomm	Mortimer Disused Source (Recommission)	Further NCA and BNG Assessment has been scoped out due to the option type and available option information. The option is not expected to generate any land use change or direct impacts on natural capital. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment
TWU_LON_HI-GRW_ALL_ALL_addington gw	Groundwater Addington	Further NCA and BNG Assessment has been scoped out due to the option type and available option information. The option is not expected to generate any land use change or direct impacts on natural capital. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment
TWU_LON_HI-ROC_NET_CNO_hampton-battersea	TWRM extension - Hampton to Battersea	Further NCA and BNG Assessment scoped out due to the option type and characteristics. The option footprint does not intersect any of

Option ID	Option Name	Reason for scoping out
		high value stocks as it is expected to be contained within a tunnel below the surface. It is expected that the option will not lead to the loss of natural capital stocks or associated ecosystem services
TWU_LON_HI-ROC_WT1_ALL_eastlonwtwexisting	Expansion of existing East London WTW	NCA scoped out (existing asset)
TWU_LON_HI-ROC_WT1_ALL_existing w lon wtw	Expansion of existing West London WTW	NCA scoped out (existing asset).
TWU_SWA_HI-GRW_ALL_ALL_datchet do	Datchet Increase DO	Further NCA and BNG Assessment has been scoped out due to the option type and available option information. The option is not expected to generate any land use change or direct impacts on natural capital. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment
TWU_SWX_HI-GRW_ALL_ALL_moulsford gw	Moulsford 1	Further NCA and BNG Assessment scoped out due to the option type and characteristics. The option footprint follows does not intersect any of high value stocks and only intersects with arable land. It is expected that the option will not lead to the loss of natural capital stocks or associated ecosystem services by following standard mitigation and any temporary impacts with not have an impact on ecosystem services
TWU_SWX_HI-GRW_RE1_ALL_britwell roc	Britwell Removal of Constraints	Further NCA and BNG Assessment scoped out due to the option type and location. The option footprint does not intersect any of high value stocks and consists of built up areas or farmland that would not be impacted by construction. It is expected that the option will not lead to the loss of natural capital stocks or associated ecosystem services
TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx)con	Thames Water (SWA) to Thames Water (SWOX) Conveyance	Further NCA and BNG Assessment has been scoped out due to the current available option information. The Option is an existing asset so no construction or operational

Option ID	Option Name	Reason for scoping out
		impacts are expected. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment
TWU_TED_HI-RAB_RE1_CNO_teddington dra 75*	Teddington DRA 75 MLD - Construction (London Reuse SRO)	Further NCA and BNG Assessment scoped out due to the option footprint not including any natural capital Stocks

Best Value Plan

The Best Value Plan (BVP) includes 17 supply-side options scoped in as requiring BNG and NCA, including the associated SROs. The BVP options and associated option descriptions are presented in Table 1.5 below.

Table 1.5: Options and descriptions scoped into the BVP (SROs demarked with an asterisk)

Option ID	Option Name	Description	Guidance used
TWU_GUI_HI-TFR_RZ5_ALL_sewtogui	SouthEast Water to Guildford	10Ml/d transfer from South East Water (Hogsback) to Mount SR Guildford. natural capital and Ecosystem Services Assessment has been scoped in due to the option type, description and rural setting. The scheme is like to cause temporary and permanent land use change associated with construction of the new option. Option has potential direct impacts on calcareous grassland and deciduous woodland Priority Habitat associated with construction of the pipeline. Option is within ALC Grade 3 and 4 land, with potential to deteriorate land quality.	Pre-2021 update
TWU_KGV_HI-TFR_TED_ALL_teddingtondrated/tlt*	Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD	Raw water abstraction at Teddington to Thames Lee Tunnel (Teddington DRA). Further NCA and BNG Assessment scoped in due to the permeant loss of natural capital stocks within the	Pre-2021 update

Option ID	Option Name	Description	Guidance used
		footprint. (London Reuse SRO)	
TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney	River Thames to Fobney Transfer	Transfer from River Thames to Fobney, to supply 40Ml/d to Kennet Valley. Existing treatment facilities available at Fobney. NCA scoped in due to the option type and setting. The option will likely cause the temporary loss of stock during construction.	Pre-2021 update
TWU_LON_HI-GRW_ALL_ALL_s'fleet lic disagg	Southfleet/Greenhithe (new WTW)	Southfleet licence disaggregation. NCA scoped in due to the option type and setting. The option will likely cause the temporary loss of stock during construction.	Pre-2021 update
TWU_LON_HI-GRW_RE1_ALL_asrhortonkirby	ASR Horton Kirby	Construction of pipelines between two existing ASR boreholes in the Lower Greensand aquifer to an existing WTW at Horton Kirby in Kent. Water abstracted from existing Chalk aquifer boreholes (via the mains supply) will be recharged into the two ASR boreholes during periods of water surplus and abstracted when needed and treated at the WTW. A new licence and discharge consent will be required from the Environment Agency to allow abstraction/recharge from the Lower Greensand aquifer. NCA scoped in due to the option type and setting. The option will likely cause the temporary loss of stock during construction.	Post-2021 update
TWU_LON_HI-ROC_WT1_CNO_kemptonwtw150	Kempton - 150 - Construction	Phase 1 Construction of new water treatment 150 Ml/d capacity within the Kempton WTW land	Pre-2021 update

Option ID	Option Name	Description	Guidance used
		boundary on land owned by Thames Water. The new treatment capacity will be used to supply the London water resource zone. NCA scoped in due to option type and available information. The options are likely to generate the temporary and permanent loss of stocks within the footprint of the WTW	
TWU_STR_HI-RSR_RE1_CNO_abingdon100(lon)*	Reservoir Abingdon 100 (Lon) - Construction	100Mm3 reservoir supplying London only. Further NCA and BNG Assessment scoped in due to the option type and rural setting. The reservoir is located predominately within agricultural land however there are some high value stocks located within the footprint. The option is expected to cause the permanent loss of some stocks through construction clearance and the establishment of new landscaping. The creation of new natural capital Stocks is anticipated through the creation of a flood compensation areas and screening planting (SESRO SRO)	Pre-2021 update
TWU_STT_HI-IMP_STT_CNO_sttpipe500(lon)*	Raw Water Transfer Deerhurst to Culham 500 Ml/d (Lon only) - Construction	Pipeline and associated infrastructure (including pump station, treatment plant, break pressure tank) to convey raw water from River Severn to River Thames. NCA scoped in due to the option type and setting. The option will likely cause the temporary loss of stock during construction. Assessment undertaken for WRSE investment	Pre-2021 update

Option ID	Option Name	Description	Guidance used
		modelling has informed this report. (STT SRO)	
TWU_STT_HI-RAB_RE1_ALL_p9-500-vyrnwy_100_b*	500: Vyrnwy Reservoir river release (75 Mld) and 25 Mld of Bypass (105Mld)	A Lake Vyrnwy source support element which extends from Lake Vyrnwy to Gloucester docks and has the capacity to release 75Ml/d (above the compensation flow) into the STT scheme. NCA scoped in due to the option type and setting. (STT SRO)	Pre-2021 update
TWU_STT_HI-REU_RE1_ALL_p5-500-neth_p35*	Netheridge STW effluent diversion (35Mld) - Cotswold Canals	35 Ml/d – Netheridge Sewage Treatment Works (STW) source support element (Covered under STW Severn Trent Sources SRO developed by STW). Discharge location is the Gloucester Docks/downstream on the Severn. Effluent diversion has the capacity to release 35Ml/d into the STT scheme. Difference between Element 5a and 5b relates to the length of discharge pipe only. NCA scoped in due to the option type and setting. The option will likely cause the temporary loss of stock during construction. (STT SRO)	Pre-2021 update
TWU_SWA_HI-TFR_SWX_ALL_swoxswa48	SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA)	Abingdon WTW to Long Crendon to supply SWA. Further NCA and BNG Assessment scoped in due to the option type and rural setting. The route intersects a variety of high value stocks. It is expected that construction of the option will lead to the loss of natural capital stocks permanently	Pre-2021 update

Option ID	Option Name	Description	Guidance used
		within the footprint of the plants.	
TWU_SWX_HI-GRW_ALL_ALL_woods farm do	Woods Farm Increase DO	New borehole to be constructed on site to bring DO up to licence (this is an additional 2.4 Ml/d to average licence of 4.99 Ml/d or an additional 2.91 Ml/d to peak licence of 5.5 Ml/d). Currently the site is only able to produce up to 2.59 Ml/d constrained by turbidity. Woods Farm WRMP24 option comprises: - Retaining the current abstraction licence with construction of a new abstraction borehole in the unconfined Chalk, 1.4 km east of the existing Woods Farm boreholes;- The option also includes a new 1.4 km raw water pipeline from the new satellite borehole to Woods Farm WTW. NCA scoped in due to the option type and setting. The option will likely cause the temporary and permanent loss of stock during construction.	Pre-2021 update
TWU_SWX_HI-IMP_SWX_ALL_wessextoswoxflax	Wessex Water to SWOX (Flaxlands)	Transfer 2.9 Ml/d from Wessex Water to Flaxlands. One new main from Minety SR (Wessex) to Flaxlands SR (TW). Also included is the transfer main from Charlton WTW to Minety SR. Scoped in for further NCA due to the option type and setting. The option will likely cause the temporary loss of stock during construction.	Post-2021 update
TWU_SWX_HI-ROC_WT1_CNO_abingdon wtw ph1	Abingdon WTW Ph1 - Construction	24 MLD Treatment works for reservoir water in Abingdon (SWOX) and for transfer	Pre-2021 update

Option ID	Option Name	Description	Guidance used
		to SWA. Purpose is to accommodate additional future demand. NCA has been scoped in due to the option type, description and rural setting. The scheme is like to cause temporary and permanent land use change associated with construction of the new option.	
TWU_TED_HI-TFR_TED_ALL_teddingtondramog/ted*	Mogden to Teddington outfall	Conveyance from Mogden to the River Thames at Teddington (Teddington DRA). Further NCA and BNG Assessment scoped in due to the option type. The site footprint includes a variety of priority habitats including Broadleaved woodland. It is expected that construction of the option will lead to temporary & permanent loss of natural capital stocks. (London Reuse SRO)	Pre-2021 update
TWU_SWX_HI-ROC_WT2_ALL_abingdon wtw ph2	Abingdon WTW Enhanced	24 MLD Treatment works for reservoir water in Abingdon (SWOX) and for transfer to SWA. Purpose is to accommodate additional future demand. natural capital and Ecosystem Services Assessment has been scoped in due to the option type, description, and rural setting. The scheme is likely to cause temporary and permanent land use change associated with construction of the new option.	Pre-2021 update
TWU_SWX_HI-TFR_HEN_ALL_henley-swox5	Henley to SWOX – 5 Ml/d	The option is for one new main from New Farm service reservoir	Pre-2021 update

Option ID	Option Name	Description	Guidance used
		(Henley) to Nettlebed service reservoir (SWOX). This will require a new 5.9km, 350mm diameter main from New Farm to Nettlebed and a new pumping station at New Farm. 5Ml/d capacity. NCA scoped in due to the option type and setting. The option will likely cause the temporary and permanent loss of stock during construction.	
TWU_SWX_HI-TFR_STR_ALL_abing-farmoor pipe	Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR)	Construction of a transfer pipeline to convey 24 Ml/d of raw water between a proposed reservoir at Abingdon and the existing Farmoor reservoir, in the SWOX WRZ. NCA has been scoped in due to the option type, description and rural setting. The scheme is like to cause temporary land use change associated with construction of the new pipeline. The pipeline would also intersect several priority habitats including coastal and floodplain grazing marsh, deciduous woodland, and lowland meadows, causing direct impacts from disturbance and habitat loss during construction. The option crosses agricultural land classed as Grade 2, 3 and 4 with disturbance to these soils during construction. The option is predominately within area Flood Zone 1 but does pass through Flood Zones 2 and 3 which may have an impact on construction.	Pre-2021 update

Option ID	Option Name	Description	Guidance used
		Flood defences are in place. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding.	
TWU_U7T_HI-RAB_RE1_ALL_p1-500-unsupported*	Pipeline conveyance, Deerhurst to Culham (500Mld)	500 Ml/d - Pipeline and associated infrastructure (including pump station, treatment plant, break pressure tank) with design capacity of 300 Ml/d to convey raw water from River Severn to River Thames. Pipeline is the same for 300/400/500 but infrastructure site extents are different. NCA scoped in due to the option type and setting. The option will likely cause the temporary and permanent loss of stock during construction. (STT SRO)	Pre-2021 update

A total of 12 options within the BVP were scoped out of natural capital and BNG assessments. Table 1.6 below outlines the scoped-out options along with the reasoning.

Table 1.6: Summary of scoped out options

Option ID	Option Name	Reason for scoping out
TWU_HEN_HI-TFR_KVZ_ALL_tw(kv)to(hen)con	Thames Water (Henley) to Thames Water (Kennet Valley) Conveyance	Potable Water Transfer -Thames Water (Henley) to Thames Water (Kennet Valley) – Conveyance. Further NCA and BNG Assessment has been scoped out due to the current available option information. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment.
TWU_KGV_HI-TFR_KGV_ALL_lockwood ps-kgv res*	TLT extension from Lockwood PS to King George V Reservoir intake (London Reuse SRO)	For modelling purposes only. New connection from Lockwood PS to the intake of KGV reservoir.
TWU_KVZ_HI-GRW_ALL_ALL_mortimer recomm	Mortimer Disused Source (Recommission)	Refurbishment of two disused abstraction boreholes located on-site at the existing, but disused Mortimer water treatment works (WTW). Water abstracted from the boreholes will be treated at the disused WTW which will

Option ID	Option Name	Reason for scoping out
		be upgraded for ammonia and iron removal and recommissioned. DO benefit 4.5 Ml/d average and peak. Further NCA and BNG Assessment has been scoped out due to the option type and available option information. The option is not expected to generate any land use change or direct impacts on natural capital. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment.
TWU_KVZ_RE-DRP_ALL_ALL_dp-playhatch-kv	DP-Playhatch-KV	Playhatch Drought Permit Option –there was no assessment as there's no corresponding GIS. Further NCA and BNG Assessment scoped out (drought permit).
TWU_LON_HI-GRW_ALL_ALL_addington gw	Groundwater Addington	New abstraction borehole & upgrade to WTW. DO benefit 1 Ml/d average, 1.5 Ml/d peak. Further NCA and BNG Assessment has been scoped out due to the option type and available option information. The option is not expected to generate any land use change or direct impacts on natural capital. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment.
TWU_LON_HI-ROC_NET_CNO_hampton-battersea	TWRM extension - Hampton to Battersea	New ring main tunnel from Hampton to Battersea. Further NCA and BNG Assessment scoped out due to the option type and characteristics. The option footprint does not intersect any of high value stocks as it is expected to be contained within a tunnel below the surface. It is expected that the option will not lead to the loss of natural capital stocks or associated ecosystem services.
TWU_SWA_HI-GRW_ALL_ALL_datchet do	Datchet Increase DO	Replacement of submersible pumps and lower of intake levels in two boreholes (two pumps) and increasing the capacity of the contact tank. DO benefit 5.4 Ml/d (peak) and 1.6 Ml/d (average). Further NCA and BNG Assessment has been scoped out due to the option type and available option information. The option is not expected to generate any land use change or direct impacts on natural capital. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment.
TWU_SWX_HI-GRW_ALL_ALL_moulsford gw	Moulsford 1	Construction of an abstraction borehole in the unconfined Chalk north of Streatley on the west bank of the River Thames. Water abstracted from the borehole will be treated at the existing Cleeve water treatment works

Option ID	Option Name	Reason for scoping out
		(WTW) located on the eastern side of the River Thames. The scheme also includes Test pumping to support application for a new abstraction licence; 0.6 km run to waste pipeline for clearance pumping of the boreholes to the River Thames; and 1.5 km raw water pipeline between the boreholes and the WTW including a crossing under the River Thames and the Great Western Railway line. DO benefit is 3.5 Ml/d peak and 2 Ml/d average. Further NCA and BNG Assessment scoped out due to the option type and characteristics. The option footprint does not intersect any of high value stocks and only intersects with arable land. It is expected that the option will not lead to the loss of natural capital stocks or associated ecosystem services by following standard mitigation and any temporary impacts with not have an impact on ecosystem services.
TWU_SWX_HI-GRW_RE1_ALL_britwell roc	Britwell Removal of Constraints	Run to waste to allow operation of existing borehole. Further NCA and BNG Assessment scoped out due to the option type and location. The option footprint does not intersect any of high value stocks and consists of built up areas or farmland that would not be impacted by construction. It is expected that the option will not lead to the loss of natural capital stocks or associated ecosystem services.
TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx)con	Thames Water (SWA) to Thames Water (SWOX) Conveyance	Potable Water Transfer -Thames Water (SWA) to Thames Water (SWOX) – Conveyance. Further NCA and BNG Assessment has been scoped out due to the current available option information. The Option is an existing asset so no construction or operational impacts are expected. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment.
TWU_SWX_RE-DRP_ALL_ALL_dp-gatehampton-swox	DP-Gatehampton-SWOX	Gatehampton Drought Permit Option – there was no assessment as there's no corresponding GIS. NCA scoped out (Drought Permit).
TWU_TED_HI-RAB_RE1_CNO_teddington dra 75*	Teddington DRA 75 MLD – Construction (London Reuse SRO)	Teddington DRA 75 MLD. Further NCA and BNG Assessment scoped out due to the option footprint not including any natural capital Stocks.

2 Methodology

2.1 Natural Capital Assessment Methodology

Water companies have a statutory obligation to produce a WRMP, which sets out how a company intends to maintain the balance between supply and demand for water over a minimum 25-year period. In the development of a WRMP, companies must follow the Environment Agency (EA) Water Resource Planning Guideline ('Guidelines') and consider broader government policy objectives. The Guidelines recommend that companies must consider the environment and society when developing the WRMP, stating that NCA and BNG should be used to inform decision-making. The natural capital approach is similarly supported by the Government's ambition to deliver environmental net gain, as set out in the 25 Year Environment Plan and Defra's Guiding Principles.

The WRSE regional plan should therefore provide a reliable NCA that is suitable to the regional scale but provides a framework to be built upon within the individual water company WRMPs.

To ensure that a natural capital approach is incorporated in a consistent way across the WRSE Regional Plan, this method statement outlines a recommended approach to the regional NCA, the quantification of impacts and the valuation of benefits and impacts. The NCA and BNG have been produced in line with best practise and guidance available at the time the assessments were undertaken, including:

- DEFRA (2020) Enabling a Natural Capital Approach
- HM Treasury and government finance (2018) The Green Book: appraisal and evaluation in central government
- Natural England (2021) The Biodiversity Metric 3.0 auditing and accounting for biodiversity (JP039)
- Natural England (2020) NERR076 Natural Capital Indicators: for defining and measuring change in natural capital
- Water Resource Planning Guideline, 2022, Environment Agency, Ofwat, Natural Resources Wales and Supplementary Planning Guidance 'Environmental and Society in Decision-Making'.

The detailed BNG methodology can be found in Chapter 2.6.

2.2 Principles of the Natural Capital Approach

Regional water resource plans taking a long-term view of water planning to 2075 are currently being prepared for each region. The Thames Water WRMP24 SEA was undertaken in the context of these plans and falls within the WRSE regional plan area. In line with the EA guidance on Environment and Society in Decision-making the WRSE regional plan NCA methodology has been developed in accordance with the following principles:

- The assessment will include the valuation of natural capital assets and ecosystem services within the footprint of each option and their zone of influence (ZoI) (see Section 2.3).
- The assessment methodology uses the most relevant qualitative, quantitative and/or monetary valuation approaches for the NCA – depending on the futures of the option. The assessment of the option's impact on the natural capital metrics will be undertaken in a sequential manner with an initial qualitative assessment, followed by a quantitative analysis and finally a monetised assessment if enough confidence exists in the values.

- Not all ecosystem services can be monetised within the NCA however those that are will be assessed against a consistent methodology. The monetised natural capital metrics will be incorporated into the cost benefit ratio as a discrete input. This monetised value will be a single figure defined by the maximum natural capital benefit. The cost of the option will not be considered within this assessment as it is captured elsewhere within the multi criteria assessment.
- Ecosystem services that are not monetised will be quantified and incorporated into the regional plan decision-making process within the SEA assessment.
- The NCA will be undertaken using open-source data in accordance with the guidance for regional assessments and to ensure that the approach is consistent across the entire study area.
- The WRSE NCA methodology aims to align the assessment of WRMPs' natural capital and ecosystem services which have previously been undertaken using separate approaches. It is hoped that the united methodology will enable joint investment in strategic and catchment-based options.
- The assessment criteria have been designed to enable the maximisation of the potential benefits from the regional plan.

2.3 Stage 1: Defining the Natural Capital Baseline

As part of the NCA of the feasible options within the regional plan a natural capital baseline has been developed for the study area. This baseline has been developed using open-source data as described in NECR285[8] to generate a natural capital account of the stocks within the Thames Water region. The list of stocks considered within the accounts and the methodology for mapping them are shown in Annex A. The methodology used to map natural capital utilised the same breakdown of stocks as the National Natural Capital Atlas where possible. However, the list has been supplemented with additional abiotic stocks and key habitats that are vital to the Thames Water region such as chalk streams and rivers.

The natural capital baseline has reported the total quantity of each stock within the study area. Monetary valuation of the natural capital baseline will not be included within the Regional natural capital baseline due to the availability of data.

The zone of influence (ZoI) for each option was defined as the area of receiving or providing environment with the potential to be altered or changed as a result of the option.

2.4 Stage 2: Option Level Natural Capital Assessment

A NCA has been undertaken on the options in accordance with the Water Resources Planning Guideline ('Guidelines') and ENCA requirements[10]. ENCA is recommended for use by HM Treasury's Green Book: appraisal and evaluation in central government (2020) and represents supplementary guidance to the Green Book.

In August 2021, ENCA updated its guidance. As mentioned in Chapter 1.2, assessments on the options agreed within the final run (BVP) have used a mix of old guidance and new guidance.

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[8] Natural England, (2020) National Natural Capital Atlas: Mapping Indicators

[10] GOV.UK. 2021. Enabling a Natural Capital Approach guidance. Available online at: https://www.gov.uk/government/publications/enabling-a-natural-capital-approach-enca-guidance/enabling-a-natural-capital-approach-guidance [Accessed April 2022].

The August 2021 ENCA guidance (GOV.UK, 2021) includes updated values within the Asset Databook and Service Databook. Within the Service Databook, the carbon reduction tab now includes the Department of Business, Energy and Industrial Strategy (BEIS) (2022) carbon values - a set of values produced by the government to be used in policy appraisal and evaluation, reflecting the latest evidence. Carbon values will differ reflecting when the assessment was undertaken; we will look to resolve this for the next iteration of the plan.

The impact of the options on the natural capital stocks was reported for each option quantitatively. This impact was reported for during construction and post construction to give an estimation of the impact of the option's whole lifecycle. The results of the stock assessment were reported in total losses and gains within each option's zone of influence, consistent for each ecosystem service.

The results of the change in natural capital stocks informed the assessment against the eight ecosystem services listed below using the Natural England logic chains, set out in Figure 2.1 below. The cost / benefit assessment was informed by the option type, option description and any embedded mitigation. The outputs of the NCA were compared to the pre-construction provision of impacted services to assess the impact of the options. Five ecosystem services were monetised (subject to the screening process set out below), and the results of the assessment reported as a discrete monetary figure, water purification and water regulation were assessed qualitatively, and biodiversity has been assessed via either the Biodiversity 2.0 Metric or the Biodiversity 3.0 Metric, depending on when assessments were undertaken[11]. A qualitative assessment of water regulation was not included within the WRSE regional planning process to avoid the potential double accounting of benefits with capacity-based and financial assessments.

Figure 2.1 Ecosystem Services valuation logic chain

The ecosystem services reviewed to assess the impact on natural capital include:

- Carbon Sequestration (Climate Regulation)
- Natural Hazard Management
- Water Purification
- Water Regulation
- Biodiversity and Habitats

[11] Natural England, DEFRA (2021). Available at: ARCHIVE SITE for the Biodiversity Metric 2.0 and the Biodiversity Metric 3.0 (nepubprod.appspot.com)

- Air Pollutant Removal
- Recreation & amenity value
- Food production

Both NCA strategies, as outlined in the Guidelines and ENCA guidance, discuss taking a proportionate approach to the assessment. It is therefore important to accommodate this when integrating a natural capital approach within the options. A natural capital approach has the potential to inform concept design and aid decision making, by quantifying the relative cost benefits and disbenefits of the options to aid the initial assessment of the identified strategic solutions.

Ecosystem Services Screening

During the initial phase of the NCA, the seven ecosystem services listed (excluding Biodiversity and Habitat, assessed by the BNG 2.0 and 3.0 Metric) were reviewed and scoped in or out due to the geographical or socio-economic context of the option and its zone of influence. Specific guidance on the screening process for individual metrics is provided below.

Carbon Sequestration (Climate Regulation)

The Climate regulation metric focuses on carbon sequestration which can be defined as the capture and secure storage of carbon that would otherwise be emitted to, or remain, in the atmosphere. The carbon sequestration NCA has been undertaken in addition to construction carbon and operational carbon calculations and provide a holistic assessment of option carbon emissions.

The assessment was determined by land management within each option ZoI, which influences the carbon store for prolonged periods of time and results in changes to net emissions. The estimate of the carbon stocks for each option footprint was based on the area of broad land use types according to literature and research. The estimated carbon stocks for broad habitat types are listed below and the sequestration rates are shown in Table 2.1 .

Table 2.1 : Carbon sequestration rates for broad habitat types (JBA Consulting) [12] [13]

Land use type	Carbon sequestration rate (tCO2e/ha/yr)
Woodland - (deciduous)	4.97
Woodland – (coniferous)	12.66
Arable Land	0.107
Pastoral land	0.397
Peatland - Undamaged	4.11
Peatland - Overgrazed	-0.1
Peatland - Rotationally burnt	-3.66
Peatland - Extracted	-4.87
Grassland	0.397
Heathland	0.7
Shrub	0.7

[12] Alonso, I., Weston, k., Gregg, r. & Morecroft, M (2012). Carbon storage by habitat - Review of the evidence of the impacts of management decisions and condition on carbon stores and sources. Natural England Research Reports, Number NERR043.

[13] Environment Agency (2020). Water resources planning guideline supplementary guidance - Environment and society in decision-making.

Land use type	Carbon sequestration rate (tCO2e/ha/yr)
Saltmarsh	5.188
Urban	0
Green Urban	0.397

The carbon sequestration rates were converted to monetary values using standard methods and the Department for Business, Energy and Industrial Strategy (BEIS) Interim Non-Traded Carbon Values. The values used in the updated guidance are set out in Table 2.2 below.

Table 2.2: BEIS interim non-traded carbon values for policy appraisal, £/tCO2e (£2020)

Year	Low series	Central series	High series
2020	120	241	361
2021	122	245	367
2022	124	248	373
2023	126	252	378
2024	128	256	384
2025	130	260	390
2026	132	264	396
2027	134	268	402
2028	136	272	408
2029	138	276	414
2030	140	280	420
2031	142	285	427
2032	144	289	433
2033	147	293	440
2034	149	298	447
2035	151	302	453
2036	155	307	460
2037	156	312	467
2038	158	316	474
2039	161	321	482
2040	163	326	489
2041	165	331	496
2042	168	336	504
2043	170	341	511
2044	173	346	519
2045	176	351	527
2046	178	356	535
2047	181	362	543
2048	184	367	551
2049	186	373	559
2050	189	378	568

Natural Hazard Regulation

Different habitat types have intrinsic flood risk management values by intercepting, storing, and slowing water flows. This is known as natural flood management (NFM) and is listed as a policy within the 25-year Environment Plan. The capacity of habitats to achieve this was quantified, and then a monetary value assigned based on the damage-costs avoided from flooding or replacement costs due to their capacity to regulate flood waters. The capacity for a given natural capital asset to provide a flood regulation service depends on two factors:

- The capacity to slow overland flows.
- Whether the asset is located in an area of flood risk.

This ecosystem service also applies in urban areas, where vegetation can reduce surface water flooding from heavy rainfall, with benefits to sewerage capacity. Coastal flood risk, which has been predicted to increase with future climate change, is reduced by coastal margin habitats such as saltmarsh.

Options have been assessed on their ability to positively or negatively impact flood risk through the comparison of pre and post construction natural capital stocks and the catchment in which it is located. The assessment is restricted to catchment areas which drain to downstream communities impacted by flooding. These communities are identified using the Environment Agency's Indicative Flood Map, which overlays areas at risk of fluvial flooding and the National Receptor Database.

Reduced flood damage to downstream or coastal settlements as a result of reduced magnitude / frequency of flood / storm events; and / or lower sewer capacity or water storage costs have been valued in line with the “valuing flood regulation services of existing forest cover to inform natural capital accounts” methodology set out by Broadmeadow et al, 2018[14]. This assessment was developed to provide indicative national estimates of water regulation services of woodland to inform natural capital accounts, this is based on modelling to estimate the potential volume of flood water avoided by woodland ecosystems in flood risk catchment. The methodology adopts a replacement-cost (rather than damage cost) approach to valuing the flood regulation service of woodland by applying annualised average capital and operating costs of flood reservoir storage that would be required in the absence of the ecosystem service.

Central estimate of the average annual costs of reservoir floodwater storage is £0.42 / m^3. The range is from £0.10 to £1.19 /m^3 per year. These "replacement costs" can be considered a lower bound of the benefit if it can be assumed that such expenditure would be deemed value for money by the flooding authorities within flood risk catchments in terms of avoided flood damage costs.[9]

Water Purification

Based on their ecological functioning, different habitat types, have varying capacities for absorbing pollutants from a given water source. This service is dependent on the location of the natural capital asset and the nature of the surrounding area. If a natural capital asset has a high capacity to remove pollutants but is not close to a water source, the service will not be provided. Due to this, valuation of the static water purification services of different natural capital assets as part of the NCA was not considered appropriate. A common value for different habitat types could not be applied due to extensive variation in local factors which determine the provisioning of this service.

[14] Broadmeadow, S., Thomas, H., Nisbet, T. and Valatin, G., 2018. Valuing flood regulation services of existing forest cover to inform natural capital accounts. Forest Research.

To account for the provision of this service within the NCA the impact of an option associated with the provision or removal of woodland and semi-natural grassland was assessed qualitatively and with consideration of the Natural Environment Valuation Online (NEVO)[15] tool.

The tool defines the resulting changes for the following water quality variables:

- Dissolved oxygen concentration
- Nitrogen concentration (including organic nitrogen, nitrate, nitrogen dioxide, ammonium)
- Phosphorous concentration (including organic and mineral phosphorous)
- Pesticide concentration (for eighteen different pesticide types)

This approach follows the methodology that if an area of woodland were to be lost, the resultant impacts on water quality can be quantified within the option's zone of influence. Any negative changes to the natural capital stocks in theory, reflects the loss of this service within each option's zone of influence.

However, there are areas in the east and south east of England that do not have consistent data for water quality variables available at the sub-catchment scale within the NEVO tool, and as such a consistent approach using quantitative data could not be applied.

Water Regulation

Water flow regulation is a key ecosystem service that can be directly impacted by both changes in land use and the implementation of supply options. Land uses such as agriculture are direct consumers of the water supply, while forests are known to promote higher rates of evapotranspiration and infiltration, which can affect local hydrologic cycles and change the amount of available water. The same natural capital stocks that provide the water supply, such as freshwater lakes and rivers, can also provide other services such as recreation and amenity, especially when near residential and urban communities. In addition to land use changes, water resource options both impact and benefit from water flow regulation. Options benefit by abstracting and providing water supply to customers, but supply options can also have varying effects on existing natural capital stocks, which in turn can affect the amount of available water. A qualitative assessment has been used to compare the positive and negative effect of each option on water flow regulation. Water regulation has only been considered qualitatively to avoid the potential double accounting of benefits with capacity-based and financial assessments, and to align with Environment Agency supplementary guidance that recommends not including monetisation of water regulation benefits in decision making.

Air Pollutant Removal

Air pollution presents a major risk to human health, resulting in premature deaths and reduced quality of life. By removing air pollution, habitats help to lessen these impacts on health and wellbeing. The provisioning of the service is positively related to several key aspects:

- The surrounding area of the natural capital assets with regards to background pollution, especially particulate pollutant.
- The quantity and type of natural capital asset, where woodland is the major service provider.
- The density of population potentially benefiting from reduced exposure. Because pollutants are transported, beneficiaries may be downwind of the ecosystem.[9]

[15] Luizzo, L., (2019) Natural Environment Valuation Online Tool - Chapter 6a: Water Quantity & Quality Model

Each option was screened against the provision of air pollutant removal according to the location of the option. Air pollutant removal was only considered within built up areas or when the zone of influence includes Air Quality Management Areas. The impact of the option was assessed according to changes in natural capital stocks.

The value provided by natural capital assets was taken from the UK government's air quality economic assessment methodology[16]. The assessment embeds these values (based on the damage cost approach, i.e., damage to health avoided from reductions in air pollution) and estimates the present value automatically based on the quantitative estimates provided. Table 2.3 shows the average values for air pollution removal in 2015 calculated from aggregate UK values, as published in February 2019.

The value of each habitat has been combined with the changes expected in natural capital stocks to provide a value for the change in service provision. The final impact has been reported as a single value that was incorporated within the NCA metric.

Table 2.3: Air pollutant value by habitat type (£2012)

Habitat group	Value (£ per hectare per year)
Urban Woodland	771
Rural Woodland	245
Urban grassland	149
Enclosed farmland	14
Coastal margins	26

Recreation & Amenity

The recreational value of green spaces can be significant. This value reflects both the natural setting and the facilities on offer at the site and often has a strong non-market element. It varies with the type and quality of habitat, location, local population density and the availability of substitute recreational opportunities. Recreational values can be beneficially affected by enhancements in green spaces, or adversely affected by new developments or infrastructure. The wider tourism and outdoor leisure sector is also dependent upon nature to varying degrees. This metric depends on the extent to which the natural capital stocks the option provides will enhance the opportunity for recreation.

The key parameter needed to estimate in this category is the number of additional or enhanced recreational visits created because of the option. This has been estimated using the Outdoor Recreation Valuation Tool[17] (ORVal). ORVal is Referenced in HM Treasury Green Book.

Random utility / travel cost model of recreational demand for all sites in England and Wales and generates probabilistic predictions of visitor numbers for any publicly accessible outdoor recreation park, path, or beach. It takes account of scarcity of sites and substitution

[16]Jones L., Vieno M., Morton Dan et al. (2019) Developing Estimates For The Valuation Of Air Pollution Removal In Ecosystem Accounts. Final Report For Office Of National Statistics - NERC Open Research Archive.

[17] ORVal, Land, Environment Economics and Policy Institute. University of Exeter. Available at: https://www.exeter.ac.uk/research/leep/research/orval/

possibilities, as well as travel distances to sites and their attributes. This is useful for baseline initial assessment, accounting, and multiple sites. This should be seen as an estimation in the absence of site-specific data on visitor numbers.

The change in natural capital stocks and, specifically, the creation or removal of greenspace has been entered into ORVal to assess the service. The change in visitors and estimated change in value has been reported for each option using the ORVal online tool, where this service has been scoped-in for assessment. Where options have not resulted in the permanent loss of greenspace, these options have been scoped-out for assessment of this service.

Food Production

Food in its various forms is produced by a range of ecosystems in some cases, the food for human consumption is effectively the same as the ecosystem service (for example, wild fruit, capture fishing). More often the provisioning service is a raw material (for example, crops) that is harvested and processed by humans and produced capital into added value processed food (for example, bread). The boundary between what is provided by natural capital and the contribution of other forms of capital is often a grey area. For example, crops require agricultural management; livestock depends upon grassland ecosystems[9].

Food production has been calculated using the NEVO agricultural model, this is a structural model of agricultural land use and production for Great Britain estimated using Farm Business Survey (2005 – 2011) and June Agricultural Census data. The agricultural land use component in NEVO builds upon the approach developed by Fezzi and Bateman[18].

NEVO has been used to assess the impact of the creation or removal of agricultural land for each option. The change in value of food provision for the footprint of each option has been calculated using this online tool and reported within the NCA metric, where this service has been scoped-in for assessment.

2.5 Stage 3: Reporting of results

The changes in natural capital stocks have been reported for each option with the results of the ecosystem services screening and detailed assessment. The natural capital metrics have been aggregated into a single metric that has been incorporated within the WRSE investment model. The impacts of each option against the individual natural capital metrics have also been reported to allow for further analysis and optimisation. The results for each option have been summarised in proforma that will demonstrate the results of the assessment and the justification behind the assessment.

The results of the NCA and BNG assessments have been incorporated into WRSE decision making processes through the conversion of the results into metrics as described below:

- Natural capital metric: A single discrete monetised value reported in £/year generated by combining the outputs of each of the five monetised natural capital metrics to provide a single cost / benefit figure.

[18] Fezzi, C., Bateman, I., Hadley, D. & Harwood, A. 2019. Natural Environment Valuation Online Tool - Chapter 1: Agriculture Model

- BNG metric: A single score for each option showing the percentage change (positive or negative) in biodiversity units (BUs) for each option according to the metric.

The results of the NCA and BNG assessments for the feasible options identified in the Thames Water WRMP24 have been presented in Chapter 3 below.

2.6 Biodiversity Net Gain Assessment Methodology

The BNG requirement as outlined in the Guidelines recommend that WRMPs should look to provide a BNG. The option assessments used the most-up-to-date guidance available at the time of undertaking the assessment. At the time of report writing, the Defra BNG 3.1 Metric is the recommended approach to net gain assessments by Natural England, released in April 2022. However, as the assessments were undertaken before this date, the 2.0 and 3.0 metrics were used, as stated in Chapter 2.4. We will be looking to update these assessments to match the latest available guidance in the next iteration of the plan.

In July 2021, Defra and Natural England launched The Biodiversity 3.0 Metric, which supersedes the BNG 2.0 Metric. The BNG 3.0 Metric presents significant improvements for measuring and accounting for habitat losses and gains. It encourages users to create and enhance habitats where they are most needed to help establish or improve ecological networks through rural and urban landscapes. By linking to current and future habitat plans and strategies, including the future Local Nature Recovery Strategies (LNRS), the BNG 3.0 Metric incentivises habitat creation and enhancement where most needed. It also 'rewards' landowners who undertake work early, creating or enhancing habitats in advance, allowing them to generate more biodiversity units from their land. Condition assessment approaches have also been significantly updated and simplified and some key changes made. Option assessments have been updated in line with BNG 3.0 Metric where feasible for the purposes of reporting.

The government anticipates the BNG 3.1 Metric (and subsequent revisions) to become the industry standard for biodiversity assessments for on-land and intertidal development types in England. As proposed in the Environment Act 2021 in November 2021, BNG must be measured using a recognised biodiversity metric. This essentially underpins the Environment Act's provisions for mandatory biodiversity net gain in England, subject to any necessary adjustments for application to major infrastructure projects. The Act further specifies the requirement of biodiversity reports to include specified quantitative data relating to biodiversity, and as such any tool for which evaluation is predominantly qualitative is not recommended.

BNG or net loss must be considered at both the option and programme level and a biodiversity optimised programme suggested as part of wider environmental optimisation. Each option should look to maximise BNG and any required mitigation should be included in the option cost. The Environment Agency supplementary guidance states that if there would be a significant additional cost for an option to get significant extra benefit, this could be included as a separate option for consideration.

A biodiversity baseline has been developed from spatial data sets of habitats inventories (see Table A.1) and assessed in line with the Defra BNG 3.0 Metric. The natural capital account has been used to identify the biodiversity value of the footprint of each option prior to construction.

The post construction land use including agreed mitigation has been used to calculate the post construction biodiversity score.

As this assessment has been carried out using only open-source data a precautionary approach has been applied, presuming that where not specifically known, habitats have been assigned the moderate habitat score. This is recommended as a suitable methodology for the scale of the WRMP Methodology updates.

2.7 Opportunities

The potential opportunities for the options to enhance natural capital and BNG were considered following the NCA and BNG assessments, utilising the data and results to inform on the most appropriate potential opportunities for enhancement of the options and wider benefits.

The BNG assessments can be revisited, and mitigation or enhancement opportunities developed further to more fully mitigate any BNG losses. Additionally, where possible, the options could aim to not only reinstate lost habitat, but also provide a greater or more diverse habitat than is lost, to achieve overall BNG in line with regulatory requirements for BNG (at the time of the project consenting) as stated as a mandatory requirement within the Environment Act 2021 (and avoid a need to purchase BNG credits to achieve the mandatory level of net gain, as current). The latter could be achieved by identifying local sites of ecological interest and proposing measures which enhance these features. This is discussed further in Chapter 5 of this document.

2.8 Assumptions and Limitations

The following assumptions have been used within the assessments in this technical note:

For NCAs:

- The costs for constructing, operating, and maintaining the options was not considered within the assessments.
- Natural capital stocks identified within the areas allocated for above ground infrastructure have been assumed to be completely lost as a result of the option construction.
- Natural capital stocks presumed temporarily lost are expected to be reinstated/compensated.

For BNG Assessments:

- No enhancement of biodiversity post construction was considered, apart from where this has been explicitly included in the option description/design, for example as part of the SRO Gate 2 designs. BNG habitat units were assigned to the pre-construction land use according to the habitats present within each option boundary. The post construction land use, including agreed mitigation, was used to calculate the post construction biodiversity score.
- The desk-based assessment was carried out using open-source data. As such, a precautionary approach was applied, presuming that where not specifically known, habitats were assigned the moderate habitat score. Habitat identification will need to be refined with habitat survey data at later gates to refine the accuracy of the BNG calculations for each option.

- The duration of disturbance and timeline for habitat creation has not been included in the assessment. Durations of disturbance, including proposals for creating habitats in advance of disturbance, will need to be refined with greater design detail at later stages to refine the accuracy of the BNG calculations for each option.

3 NCA and BNG Assessment Outputs

3.1 Assessment of Reasonable Alternatives Programmes

Outline of tables for each plan in this Chapter:

- Table 3.1, 3.5, 3.9 - Predicted impacts on natural capital stocks
- Table 3.2, 3.6, 3.10 - Quantitative detailed assessment of the unmitigated predicted permanent impacts on the provision of ecosystem services
- Table 3.3, 3.7, 3.11 - Qualitative assessment of the unmitigated predicted impacts on the provision of water purification and water flow regulation
- Table 3.4, 3.8, 3.12 - Summary of the unmitigated BNG Metric outputs

Least Cost Plan

Table 3.1 : Least Cost - Predicted impacts on natural capital stocks

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
SouthEast Water to Guildford				
Arable	12.56	0.00	11.96	-0.60
Pastoral	2.93	0.00	2.93	0.00
Other semi-natural grassland	4.36	0.00	4.36	0.00
Broadleaved, Mixed and Yew Woodland	3.43	0.00	3.43	0.00
Coniferous Woodland	2.79	0.00	2.79	0.00
Bluespace	0.06	0.06	0.06	0.00
Greenspace	0.33	0.00	0.33	0.00
Urban Woodland	2.54	0.00	2.54	0.00
Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD				
Broadleaved, Mixed and Yew Woodland	0.12	0.00	0.0	-0.12
Active floodplain	0.05	0.00	0.00	-0.05
Lakes and standing waters	0.00	0.00	1.00	1.00
Modified Waters (Reservoirs)	0.00	0.00	2.00	2.00
T2ST Culham to Speen transfer				
Pastoral	2.14	0.00	2.14	0.00
Broadleaved, Mixed and Yew Woodland	0.01	0.00	0.01	0.00
Woodland Priority Habitat	0.10	0.00	0.10	0.00
Active Floodplain	0.13	0.13	0.13	0.00
River Thames to Fobney Transfer				
Coastal and Floodplain Grazing Marsh	2.45	0.00	2.45	0.00
Pastoral	0.01	0.00	0.01	0.00
Woodland Priority Habitat	1.28	0.00	1.28	0.00

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Greenspace	0.34	0.00	0.34	0.00
Urban semi-natural woodland	0.000096	0.00	0.000096	0.00
Urban Woodland	0.03	0.00	0.03	0.00
Active flood plain	3.97	3.97	3.97	0.00
Rivers	332.40	332.40	332.40	0.00
Ponds and linear features	0.04	0.04	0.04	0.00
Southfleet/Greenhithe (new WTW)				
Arable	5.68	0.00	5.68	0.00
Pastoral	2.43	0.00	2.43	0.00
Broadleaved, Mixed and Yew Woodland	1.04	0.00	1.04	0.00
Ponds and linear features	0.02	0.02	0.02	0.00
ASR Horton Kirby				
Arable	0.36	0.00	0.36	0.00
Pastoral	2.28	0.00	2.28	0.00
Broadleaved, Mixed and Yew Woodland	0.00085	0.00	0.00085	0.00
Woodland Priority Habitat	0.33	0.00	0.33	0.00
Active flood plain	1.20	1.20	1.20	0.00
Kempton - 150 - Construction				
Broadleaved, Mixed and Yew Woodland	7.09	0.00	7.09	0.00
Urban Woodland	0.36	0.00	0.36	0.00
Lakes and Standing Waters	2.17	0.00	0.00	-2.17
Ponds and linear features	0.81	0.00	0.00	-0.81
New Reservoir Abingdon 150 Mm3 - 283 MLD (Lon only) - Construction				
Coastal and Floodplain Grazing Marsh	68.01	0.00	82.37	14.36
Arable	1358.42	0.00	634.15	-724.27
Pastoral	52.20	0.00	0.00	-52.20
Orchards and Top Fruit	0.18	0.00	0.00	-0.18
Other semi-natural grassland	0.00	0.00	229.08	229.08
Broadleaved, Mixed and Yew Woodland	42.44	0.00	54.86	12.42
Coniferous Woodland	2.21	0.00	0.00	-2.21
Active floodplain	351.18	82.37	82.37	-268.81
Lakes and standing waters	0.00	647.94	647.94	647.94

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Ponds and linear features	2.68	9.98	9.98	7.30
Raw Water Transfer Deerhurst to Culham 300 Ml/d (Lon only) - Construction				
Coastal and Floodplain Grazing Marsh	0.25	0.00	0.25	0.00
Arable	194.01	0.00	194.01	0.00
Pastoral	91.19	0.00	91.19	0.00
Orchards and Top Fruit	0.50	0.00	0.00	-0.50
Hay Meadows	1.42	0.00	1.42	0.00
Other semi-natural grassland	12.50	0.00	12.50	0.00
Broadleaved, Mixed and Yew Woodland	0.48	0.00	0.48	0.00
Coniferous Woodland	0.03	0.00	0.03	0.00
Ancient Woodland	0.05	0.00	0.00	-0.05
Greenspace	0.29	0.00	0.29	0.00
Active flood plain	50.66	50.66	50.66	0.00
Rivers	0.04	0.04	0.04	0.00
Ponds and linear features	0.03	0.03	0.03	0.00
Netheridge STW effluent diversion (35Mld) - Cotswold Canals				
Coastal and Floodplain Grazing Marsh	0.50	0.00	0.50	0.00
Pastoral	0.95	0.00	0.95	0.00
Other semi-natural grassland	0.34	0.00	0.34	0.00
Broadleaved, Mixed and Yew Woodland	0.0003	0.0003	0.0003	0.00
Bluespace	0.02	0.02	0.02	0.00
Greenspace	0.27	0.00	0.27	0.00
Active flood plain	3.16	3.16	3.16	0.00
Rivers	0.10	0.10	0.10	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
Potential Henley resource for SWA				
Arable	15.96	0.00	15.02	-0.94
Pastoral	4.57	0.00	4.34	-0.23
Broadleaved, Mixed and Yew Woodland	0.65	0.00	0.65	0.00
Coniferous Woodland	0.05	0.00	0.05	0.00
Ancient Woodland	0.05	0.01	0.01	-0.04
Urban Woodland	0.02	0.00	0.02	0.00
Active floodplain	1.70	1.70	1.70	0.00
Henley to SWA – 5 Ml/d				

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Arable	15.96	0.00	15.02	-0.94
Pastoral	4.57	0.00	4.34	-0.23
Broadleaved, Mixed and Yew Woodland	0.65	0.00	0.65	0.00
Coniferous Woodland	0.05	0.00	0.05	0.00
Ancient Woodland	0.05	0.01	0.01	-0.04
Urban Woodland	0.02	0.00	0.02	0.00
Active flood plain	1.70	1.70	1.70	0.00
SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA)				
Coastal and Floodplain Grazing Marsh	5.33	0.00	5.33	0.00
Arable	53.51	0.00	52.07	-1.44
Pastoral	40.08	0.00	37.20	-2.88
Hay Meadows	0.43	0.43	0.43	0.00
Other semi-natural grassland	0.56	0.00	0.56	0.00
Broadleaved, Mixed and Yew Woodland	0.89	0.00	0.89	0.00
Coniferous Woodland	0.05	0.00	0.05	0.00
Ancient Woodland	0.00*	0.00*	0.00*	0.00
Active flood plain	19.62	19.62	19.62	0.00
Ponds and linear features	0.07	0.07	0.07	0.00
Woods Farm Increase DO				
Arable	3.28	0.00	3.28	0.00
Pastoral	2.48	0.00	2.48	0.00
Other semi-natural grassland	0.00	0.00	0.00	0.00
Broadleaved, Mixed and Yew Woodland	0.71	0.00	0.71	0.00
Ancient Woodland	0.20	0.00	0.00	-0.20
Active flood plain	0.33	0.33	0.33	0.00
Wessex Water to SWOX (Flaxlands)				
Arable	1.36	0.00	1.36	0.00
Pastoral	22.28	0.00	22.28	0.00
Hay Meadows	0.48	0.00	0.48	0.00
Other semi-natural grassland	1.17	0.00	1.17	0.00
Broadleaved, Mixed and Yew Woodland	0.03	0.00	0.03	0.00
Active flood plain	0.87	0.87	0.09	0.00
Ponds and linear features	0.02	0.02	0.02	0.00
Oxford Canal - Duke's Cut (SWOX) - Construction				
Coastal and Floodplain Grazing Marsh	12.91	0.00	12.91	0.00
Lowland Fens	0.27	0.00	0.27	0.00

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Arable	88.43	0.00	88.43	0.00
Pastoral	81.17	0.00	81.17	0.00
Orchards and Top Fruit	0.003	0.00	0.00	-0.003
Hay Meadows	0.07	0.00	0.07	0.00
Other semi-natural grassland	3.15	0.00	3.15	0.00
Dwarf Shrub Heath	0.48	0.00	0.48	0.00
Broadleaved, Mixed and Yew Woodland	21.15	0.00	21.15	0.00
Coniferous Woodland	0.07	0.00	0.07	0.00
Ancient Woodland	0.000005	0.00	0.00	-0.000005
Blue space	78.01	78.01	78.01	0.00
Greenspace	4.58	0.00	4.58	0.00
Urban semi-natural woodland	3.25	0.00	3.25	0.00
Urban Woodland	0.21	0.00	0.21	0.00
Lakes and Standing Waters	0.77	0.77	0.77	0.00
Rivers	47.43	47.43	47.43	0.00
Modified Waters (Reservoirs)	0.01	0.01	0.01	0.00
Ponds and linear features	62.05	62.05	62.05	0.00
Abingdon WTW Ph1 - Construction				
Coastal and Floodplain Grazing Marsh	0.37	0.00	0.37	0.00
Arable	6.36	0.00	2.64	-3.72
Pastoral	0.04	0.00	0.04	0.00
Broadleaved, Mixed and Yew Woodland	0.03	0.00	0.03	0.00
Active floodplain	0.86	0.86	0.86	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR)				
Coastal and Floodplain Grazing Marsh	2.29	0.00	2.29	0.00
Arable	10.51	0.00	10.51	0.00
Pastoral	16.47	0.00	16.47	0.00
Hay Meadows	0.10	0.00	0.10	0.00
Broadleaved, Mixed and Yew Woodland	0.51	0.00	0.51	0.00
Coniferous Woodland	0.22	0.00	0.22	0.00
Active floodplain	4.51	4.51	4.51	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
Dukes Cut to Farmoor				

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Coastal and Floodplain Grazing Marsh	6.72	0.00	6.72	0.00
Arable	8.40	0.00	8.40	0.00
Pastoral	4.60	0.00	4.60	0.00
Hay Meadows	0.69	0.00	0.69	0.00
Active floodplain	11.95	11.95	11.95	0.00
Ponds and linear features	0.06	0.06	0.06	0.00
Mogden to Teddington outfall 75 Ml/d				
Broadleaved, Mixed and Yew Woodland	1.26	0.00	0.00	-1.26
Urban semi natural habitat	0.12	0.12	0.12	0.00
Active floodplain	1.80	1.80	1.50	-0.30
Blue space	0.08	0.00	0.08	0.00
Ponds and linear features	0.04	0.04	0.04	0.00
Greenspace	1.77	0.00	1.51	-0.26
300: Unsupported flow				
Coastal and Floodplain Grazing Marsh	0.25	0.00	0.25	0.00
Arable	194.01	0.00	194.01	0.00
Pastoral	91.19	0.00	91.19	0.00
Orchards and Top Fruit	0.50	0.00	0.00	-0.50
Hay Meadows	1.42	0.00	1.42	0.00
Other semi-natural grassland	12.50	0.00	12.50	0.00
Broadleaved, Mixed and Yew Woodland	0.48	0.00	0.48	0.00
Coniferous Woodland	0.03	0.00	0.03	0.00
Ancient Woodland	0.05	0.00	0.00	-0.05
Greenspace	0.29	0.00	0.29	0.00
Active floodplain	50.66	50.66	50.66	0.00
Rivers	0.04	0.04	0.04	0.00
Ponds and linear features	0.03	0.03	0.03	0.00

(Figures rounded to 2sp, those with '0.00*' have a very small value.)

Table 3.2 : Least Cost - Quantitative detailed assessment of the unmitigated predicted permanent impacts on the provision of ecosystem services

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
SouthEast Water to Guildford					
Carbon storage	£2,413.89	£0.00	-£2,413.89	£1,695.22	-£718.67

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Natural hazard management	£776.14	£0.00	-£776.14	£582.10	-£194.03
Air Pollutant Removal	£3,658.08	£0.00	-£3,658.08	£2,779.12	-£878.96
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£311,200.00	£311,011.00	-£189.00	£311,011.00	-£189.00
Total	£318,048.10	£311,011.00	-£7,037.10	£316,067.44	-£1,980.66
Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD					
Carbon storage	£16.51	£0.00	£0.00	£0.00	-£16.51
Natural hazard management	£10.63	£0.00	£0.00	£0.00	-£10.63
Air Pollutant Removal	£92.52	£0.00	£0.00	£0.00	-£92.52
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£119.67	£0.00	£0.00	£0.00	-£119.67
T2ST Culham to Speen transfer					
Carbon storage	£38.99	£0.00	-£38.99	£35.12	-£3.86
Natural hazard management	£9.95	£0.00	-£9.95	£7.46	-£2.49
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£48.93	£0.00	-£48.93	£42.58	-£6.35
River Thames to Fobney Transfer					
Carbon storage	£2,388.06	£0.00	-£2,388.06	£1,791.55	-£596.52
Natural hazard management	£115.90	£0.00	-£115.90	£86.93	-£28.98
Air Pollutant Removal	£335.75	£0.00	-£335.75	£251.82	-£83.93
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£2,839.71	£0.00	-£2,839.71	£2,130.29	-£709.42
Southfleet/Greenhithe (new WTW)					
Carbon storage	£270.56	£0.00	-£270.56	£234.84	-£35.71
Natural hazard management	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£270.56	£0.00	-£270.56	£234.84	-£35.71
ASR Horton Kirby					
Carbon storage	£1,423.66	£0.00	-£1,423.66	£1,274.03	-£149.63
Natural hazard management	£29.07	£0.00	-£29.07	£21.81	-£7.27
Air Pollutant Removal	£85.40	£0.00	-£85.40	£65.30	-£20.10
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Total	£1,538.14	£0.00	-£1,538.14	-£1,361.14	-£177.00
Kempton - 150 - Construction					
Carbon storage	£1,074.81	£0.00	-£1,074.81	£781.33	-£293.47
Natural hazard management	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	£2,014.61	£0.00	-£2,014.61	£1,510.96	-£503.65
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£3,089.42	£0.00	-£3,089.42	£2,292.29	-£797.13
New Reservoir Abingdon 150 Mm3 - 283 MLD (Lon only) - Construction					
Carbon storage	£22,950.36	£0.00	-£22,950.36	£15t,151.77	-£7,798.59
Natural hazard management	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	£0.00	£0.00	£0.00	£270,842.00	£270,842.00
Food production	£1,700,000.00	£0.00	-£1,700,000.00	£1,460,900.00	-£239,100.00
Total	£1,722,950.36	£0.00	-£1,722,950.36	£1,746,893.77	£23,943.41
Raw Water Transfer Deerhurst to Culham 300 Ml/d (Lon only) - Construction					
Carbon storage	£4,818.51	£0.00	-£4,818.51	£4,762.49	-£56.02
Natural hazard management	£49.62	£0.00	-£49.62	£33.89	-£15.73
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£4,868.13	£0.00	-£4,868.13	£4,796.38	-£71.75
Netheridge STW effluent diversion (35Mld) - Cotswold Canals					
Carbon storage	£29.30	£0.04	-£29.25	£29.28	-£0.01
Natural hazard management	£0.03	£0.03	£0.00	£0.02	-£0.01
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£29.32	£0.07	-£29.25	£29.30	-£0.02
Potential Henley resource for SWA					
Carbon storage	£417.56	£0.00	-£417.56	£351.52	-£66.04
Natural hazard management	£68.22	£0.00	-£68.22	£44.52	-£23.70
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£1,800,000.00	£1,799,620.00	-£380.00	£1,799,620.00	-£380.00
Total	£1,800,485.78	£1,799,620.00	-£865.78	£1,800,016.05	-£469.74
Henley to SWA – 5 Ml/d					
Carbon storage	£3,799.19	£18.24	-£3,780.95	£3,225.61	-£573.59
Natural hazard management	£68.22	£0.89	-£67.34	£47.84	-£20.38
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£1,800,000.00	£1,799,620.00	-£380.00	£1,799,620.00	-£380.00
Total	£1,803,867.41	£1,799,639.13	-£4,228.29	£1,802,893.45	-£973.96
SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA)					
Carbon storage	£1,814.71	£0.00	-£1,814.71	£1,686.81	-£127.90
Natural hazard management	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£4,600,000.00	£4,598,900.00	-£1,100.00	£4,598,900.00	-£1,100.00
Total	£4,601,814.71	£4,598,900.00	-£2,914.71	£4,600,586.81	-£1,227.90
Woods Farm Increase DO					
Carbon storage	£2,671.49	£0.00	-£2,671.49	£1,982.93	-£688.56
Natural hazard management	£80.63	£0.00	-£80.63	£47.18	-£33.45
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£2,752.11	£0.00	-£2,752.11	£2,030.11	-£722.00
Wessex Water to SWOX (Flaxlands)					
Carbon storage	£3,653.47	£0.00	-£3,653.47	£3,639.57	-£13.90
Natural hazard management	£2.66	£0.00	-£2.66	£1.99	-£0.66
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£3,656.13	£0.00	-£3,656.13	£3,641.56	-£14.57
Oxford Canal - Duke's Cut (SWOX) - Construction					
Carbon storage	£6,180.52	£0.00	-£6,180.52	£5,417.62	-£762.90
Natural hazard management	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	£7,085.07	£0.00	-£7,085.07	£5,744.46	-£1,340.61
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£13,265.59	£0.00	-£13,265.59	£11,162.08	-£2,103.51
Abingdon WTW Ph1 - Construction					
Carbon storage	£75.12	£0.00	-£75.12	£33.19	-£41.93
Natural hazard management	£2.66	£0.00	-£2.66	£1.99	-£0.66
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£804,100.00	£802,800.00	-£1,300.00	£802,800.00	-£1,300.00
Total	£804,177.78	£802,800.00	-£1,377.78	£802,835.19	-£1,342.59
Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR)					
Carbon storage	£706.32	£0.00	-£706.32	£669.49	-£36.83

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Natural hazard management	£64.64	£0.00	-£64.68	£48.51	-£16.17
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£770.99	£0.00	-£770.99	£718.00	-£53.00
Dukes Cut to Farmoor					
Carbon storage	£223.48	£0.00	-£223.48	£223.48	£0.00
Natural hazard management	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£223.48	£0.00	-£223.48	£223.48	£0.00
Mogden to Teddington outfall 75 Ml/d					
Carbon storage	£174.72	£0.00	£5.78	£5.78	-£168.94
Natural hazard management	£111.64	£0.00	£10.63	£0.00	-£111.64
Air Pollutant Removal	£989.34	£0.00	£17.68	£0.00	-£989.34
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£1,275.70	£0.00	£34.09	£5.78	-£1,269.92
300: Unsupported flow					
Carbon storage	£4,818.51	£0.00	-£4,818.51	£4,792.49	-£26.02
Natural hazard management	£49.62	£0.00	-£49.62	£33.89	-£15.73
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£4,868.13	£0.00	-£4,868.13	£4,826.38	-£41.75

Table 3.3 : Least Cost - Qualitative assessment of the unmitigated predicted impacts on the provision of water purification and water flow regulation

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
Water Purification				

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
- South East Water to Guildford - T2ST Culham to Speen transfer - River Thames to Fobney Transfer - Southfleet/Greenhithe (new WTW) - ASR Horton Kirby - Kempton - 150 – Construction - Netheridge STW effluent diversion (35Mld) - Cotswold Canals - SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA) - Potential Henley resource for SWA - Abingdon WTW Ph1 – Construction - Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR) - New Reservoir Abingdon 150 Mm3 - 283 MLD (Lon only) - Construction - Dukes Cut to Farmoor - Mogden to Teddington outfall 75 Ml/d - 300: Unsupported flow - Raw Water Transfer Deerhurst to Culham 300 Ml/d (Lon only) - Construction	The stock likely provides a high provision of the ecosystem service due to the natural capital asset's high capacity to store and absorb pollutants and the proximity of the asset to a water source.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely be reduced	The provision of water purification provided by the stock will likely be reduced due to the option.
- Henley to SWA – 5 Ml/d - Woods Farm Increase DO - Oxford Canal - Duke's Cut (SWOX) – Construction - Direct River Abstraction - Teddington to Thames Lee	The stock likely provides a high provision of the ecosystem service due to the natural capital asset's high capacity to store and absorb pollutants and the proximity of the asset to a water source.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely be reduced	The provision of water purification provided by the stock will likely be reduced due to the option. Future provision of ecosystem services provided by Ancient Woodland will be permanently lost as is a high value natural capital stock

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
Tunnel Shaft 75 MLD				that cannot be replaced or replicated once lost.
- **Water Regulation**				
- South East Water to Guildford - T2ST Culham to Speen transfer - River Thames to Fobney Transfer - Southfleet/Greenhithe (new WTW) - ASR Horton Kirby - Netheridge STW effluent diversion (35Mld) - Cotswold Canals - Henley to SWA – 5 Ml/d - SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA) - Woods Farm Increase DO - Oxford Canal - Duke's Cut (SWOX) – Construction - Potential Henley resource for SWA - Abingdon WTW Ph1 – Construction - Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR) - Dukes Cut to Farmoor - Mogden to Teddington outfall 75 Ml/d - 300: Unsupported flow - Raw Water Transfer Deerhurst to Culham 300 Ml/d	The stocks provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The preservation of stocks will reduce negative impacts to the ecosystem service.	The provision of services will be retained during construction.	The future provision of the ecosystem service provided by the stock will likely remain.	0

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
(Lon only) - Construction				
- Kempton - 150 - Construction	The stocks provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The preservation of stocks will reduce negative impacts to the ecosystem service.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely reduce slightly.	-
- Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD - New Reservoir Abingdon 150 Mm3 - 283 MLD (Lon only) - Construction	The stocks provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The loss of stocks will increase negative impacts to the ecosystem service.	The provision of water flow regulation services of contributing stocks will be lost during construction. However, the addition of a reservoir will bring additional water flow regulation to the environment.	The loss of contributing stocks has the potential to impede water flow on site. The addition of a reservoir will regulate flows, control water movement and maintain water supplies in dry periods, enabling a resilient supply of water to consumers, however the loss of existing stocks will require a Level 2 WFD. As such, the impact of the option on water flow regulation cannot be assessed at this stage.	+++

Table 3.4 : Least Cost - Summary of the unmitigated BNG Metric outputs

Natural capital stock	On-site Baseline (Habitat BU*)	On-Site Post Intervention (Habitat BU)	Total Net Unit change (Habitat BU)	Total Percentage Change (Habitat BU)
SouthEast Water to Guildford	255.40	72.38	-183.02	-71.66%
Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD	2.38	0.00	-2.38	-100.00%
T2ST Culham to Speen transfer	10.82	6.75	-4.07	-37.61%
River Thames to Fobney Transfer	51.57	9.02	-42.55	-82.51%
Southfleet/Greenhithe (new WTW)	37.18	21.26	-15.92	-42.82%
ASR Horton Kirby	15.19	8.25	-6.94	-45.67%
Kempton - 150 - Construction	157.34	21.57	-135.77	-89.29%
New Reservoir Abingdon 150 Mm3 - 283 MLD (Lon only) - Construction	4969.76	7356.69	2386.93	48.03%
Raw Water Transfer Deerhurst to Culham 300 Ml/d (Lon only) - Construction	1036.09	746.96	-289.13	-27.91%
Netheridge STW effluent diversion (35Mld) - Cotswold Canals	16.77	6.10	-10.67	-63.62%
Potential Henley resource for SWA	74.18	50.62	-23.57	-31.77%
Henley to SWA – 5 Ml/d	55.76	47.09	-8.67	-15.55%
SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA)	523.97	283.53	-240.45	-45.89%
Woods Farm Increase DO	25.00	15.83	-9.17	-36.67%
Wessex Water to SWOX (Flaxlands)	113.96	13.32	-100.64	-88.31%
Oxford Canal - Duke's Cut (SWOX) - Construction	2607.62	2057.43	-550.20	-21.10%
Abingdon WTW Ph1 - Construction	22.18	6.87	-15.30	-69.01%
Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR)	188.19	95.90	-92.29	-49.04%
Dukes Cut to Farmoor	201.30	65.77	-135.53	-67.33%
Mogden to Teddington outfall 75 Ml/d	17.69	2.60	-15.09	-85.30%
300: Unsupported flow	1036.09	746.96	-289.13	-27.91%

*Biodiversity Units (BUs)

Best Environmental and Societal Plan (BESP)

Table 3.5 : BESP- Predicted impacts on natural capital stocks

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
SouthEast Water to Guildford				
Arable	12.56	0.00	11.96	-0.60
Pastoral	2.93	0.00	2.93	0.00
Other semi-natural grassland	4.36	0.00	4.36	0.00
Broadleaved, Mixed and Yew Woodland	3.43	0.00	3.43	0.00
Coniferous Woodland	2.79	0.00	2.79	0.00
Bluespace	0.06	0.06	0.06	0.00

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Greenspace	0.33	0.00	0.33	0.00
Urban Woodland	2.54	0.00	2.54	0.00
Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD				
Broadleaved, Mixed and Yew Woodland	0.12	0.00	0.0	-0.12
Active floodplain	0.05	0.00	0.00	-0.05
Lakes and standing waters	0.00	0.00	1.00	1.00
Modified Waters (Reservoirs)	0.00	0.00	2.00	2.00
T2ST Culham to Speen transfer				
Pastoral	2.14	0.00	2.14	0.00
Broadleaved, Mixed and Yew Woodland	0.01	0.00	0.01	0.00
Woodland Priority Habitat	0.10	0.00	0.10	0.00
Active Floodplain	0.13	0.13	0.13	0.00
River Thames to Fobney Transfer				
Coastal and Floodplain Grazing Marsh	2.45	0.00	2.45	0.00
Pastoral	0.01	0.00	0.01	0.00
Woodland Priority Habitat	1.28	0.00	1.28	0.00
Greenspace	0.34	0.00	0.34	0.00
Urban semi-natural woodland	0.000096	0.00	0.000096	0.00
Urban Woodland	0.03	0.00	0.03	0.00
Active flood plain	3.97	3.97	3.97	0.00
Rivers	332.40	332.40	332.40	0.00
Ponds and linear features	0.04	0.04	0.04	0.00
Southfleet/Greenhithe (new WTW)				
Arable	5.68	0.00	5.68	0.00
Pastoral	2.43	0.00	2.43	0.00
Broadleaved, Mixed and Yew Woodland	1.04	0.00	1.04	0.00
Ponds and linear features	0.02	0.02	0.02	0.00
ASR Horton Kirby				
Arable	0.36	0.00	0.36	0.00
Pastoral	2.28	0.00	2.28	0.00
Broadleaved, Mixed and Yew Woodland	0.00085	0.00	0.00085	0.00
Woodland Priority Habitat	0.33	0.00	0.33	0.00
Active flood plain	1.20	1.20	1.20	0.00
Kempton - 150 - Construction				
Broadleaved, Mixed and Yew Woodland	7.09	0.00	7.09	0.00
Urban Woodland	0.36	0.00	0.36	0.00
Lakes and Standing Waters	2.17	0.00	0.00	-2.17
Ponds and linear features	0.81	0.00	0.00	-0.81
New Reservoir Abingdon 150 Mm3 - 283 MLD (Lon only) - Construction				

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Coastal and Floodplain Grazing Marsh	68.01	0.00	82.37	14.36
Arable	1358.42	0.00	634.15	-724.27
Pastoral	52.20	0.00	0.00	-52.20
Orchards and Top Fruit	0.18	0.00	0.00	-0.18
Other semi-natural grassland	0.00	0.00	229.08	229.08
Broadleaved, Mixed and Yew Woodland	42.44	0.00	54.86	12.42
Coniferous Woodland	2.21	0.00	0.00	-2.21
Active floodplain	351.18	82.37	82.37	-268.81
Lakes and standing waters	0.00	647.94	647.94	647.94
Ponds and linear features	2.68	9.98	9.98	7.30
Raw Water Transfer Deerhurst to Culham 300 Ml/d (Lon only) - Construction				
Coastal and Floodplain Grazing Marsh	0.25	0.00	0.25	0.00
Arable	194.01	0.00	194.01	0.00
Pastoral	91.19	0.00	91.19	0.00
Orchards and Top Fruit	0.50	0.00	0.00	-0.50
Hay Meadows	1.42	0.00	1.42	0.00
Other semi-natural grassland	12.50	0.00	12.50	0.00
Broadleaved, Mixed and Yew Woodland	0.48	0.00	0.48	0.00
Coniferous Woodland	0.03	0.00	0.03	0.00
Ancient Woodland	0.05	0.00	0.00	-0.05
Greenspace	0.29	0.00	0.29	0.00
Active flood plain	50.66	50.66	50.66	0.00
Rivers	0.04	0.04	0.04	0.00
Ponds and linear features	0.03	0.03	0.03	0.00
Netheridge STW effluent diversion (35Mld) - Cotswold Canals				
Coastal and Floodplain Grazing Marsh	0.50	0.00	0.50	0.00
Pastoral	0.95	0.00	0.95	0.00
Other semi-natural grassland	0.34	0.00	0.34	0.00
Broadleaved, Mixed and Yew Woodland	0.0*	0.00*	0.00*	0.00
Bluespace	0.02	0.02	0.02	0.00
Greenspace	0.27	0.00	0.27	0.00
Active flood plain	3.16	3.16	3.16	0.00
Rivers	0.10	0.10	0.10	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
Potential Henley resource for SWA				
Arable	15.96	0.00	15.02	-0.94
Pastoral	4.57	0.00	4.34	-0.23
Broadleaved, Mixed and Yew Woodland	0.65	0.00	0.65	0.00
Coniferous Woodland	0.05	0.00	0.05	0.00
Ancient Woodland	0.05	0.01	0.01	-0.04

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Urban Woodland	0.02	0.00	0.02	0.00
Active floodplain	1.70	1.70	1.70	0.00
Henley to SWA – 5 Ml/d				
Arable	15.96	0.00	15.02	-0.94
Pastoral	4.57	0.00	4.34	-0.23
Broadleaved, Mixed and Yew Woodland	0.65	0.00	0.65	0.00
Coniferous Woodland	0.05	0.00	0.05	0.00
Ancient Woodland	0.05	0.01	0.01	-0.04
Urban Woodland	0.02	0.00	0.02	0.00
Active flood plain	1.70	1.70	1.70	0.00
SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA)				
Coastal and Floodplain Grazing Marsh	5.33	0.00	5.33	0.00
Arable	53.51	0.00	52.07	-1.44
Pastoral	40.08	0.00	37.20	-2.88
Hay Meadows	0.43	0.43	0.43	0.00
Other semi-natural grassland	0.56	0.00	0.56	0.00
Broadleaved, Mixed and Yew Woodland	0.89	0.00	0.89	0.00
Coniferous Woodland	0.05	0.00	0.05	0.00
Ancient Woodland	0.00*	0.00*	0.00*	0.00
Active flood plain	19.62	19.62	19.62	0.00
Ponds and linear features	0.07	0.07	0.07	0.00
Woods Farm Increase DO				
Arable	3.28	0.00	3.28	0.00
Pastoral	2.48	0.00	2.48	0.00
Other semi-natural grassland	0.00	0.00	0.00	0.00
Broadleaved, Mixed and Yew Woodland	0.71	0.00	0.71	0.00
Ancient Woodland	0.20	0.00	0.00	-0.20
Active flood plain	0.33	0.33	0.33	0.00
Wessex Water to SWOX (Flaxlands)				
Arable	1.36	0.00	1.36	0.00
Pastoral	22.28	0.00	22.28	0.00
Hay Meadows	0.48	0.00	0.48	0.00
Other semi-natural grassland	1.17	0.00	1.17	0.00
Broadleaved, Mixed and Yew Woodland	0.03	0.00	0.03	0.00
Active flood plain	0.87	0.87	0.09	0.00
Ponds and linear features	0.02	0.02	0.02	0.00
Oxford Canal - Duke's Cut (SWOX) - Construction				
Coastal and Floodplain Grazing Marsh	12.91	0.00	12.91	0.00
Lowland Fens	0.27	0.00	0.27	0.00
Arable	88.43	0.00	88.43	0.00
Pastoral	81.17	0.00	81.17	0.00
Orchards and Top Fruit	0.00*	0.00	0.00	0.00*
Hay Meadows	0.07	0.00	0.07	0.00

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Other semi-natural grassland	3.15	0.00	3.15	0.00
Dwarf Shrub Heath	0.48	0.00	0.48	0.00
Broadleaved, Mixed and Yew Woodland	21.15	0.00	21.15	0.00
Coniferous Woodland	0.07	0.00	0.07	0.00
Ancient Woodland	0.00*	0.00	0.00	0.00*
Blue space	78.01	78.01	78.01	0.00
Greenspace	4.58	0.00	4.58	0.00
Urban semi-natural woodland	3.25	0.00	3.25	0.00
Urban Woodland	0.21	0.00	0.21	0.00
Lakes and Standing Waters	0.77	0.77	0.77	0.00
Rivers	47.43	47.43	47.43	0.00
Modified Waters (Reservoirs)	0.01	0.01	0.01	0.00
Ponds and linear features	62.05	62.05	62.05	0.00
Abingdon WTW Ph1 - Construction				
Coastal and Floodplain Grazing Marsh	0.37	0.00	0.37	0.00
Arable	6.36	0.00	2.64	-3.72
Pastoral	0.04	0.00	0.04	0.00
Broadleaved, Mixed and Yew Woodland	0.03	0.00	0.03	0.00
Active floodplain	0.86	0.86	0.86	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR)				
Coastal and Floodplain Grazing Marsh	2.29	0.00	2.29	0.00
Arable	10.51	0.00	10.51	0.00
Pastoral	16.47	0.00	16.47	0.00
Hay Meadows	0.10	0.00	0.10	0.00
Broadleaved, Mixed and Yew Woodland	0.51	0.00	0.51	0.00
Coniferous Woodland	0.22	0.00	0.22	0.00
Active floodplain	4.51	4.51	4.51	0.00
Ponds and linear features	0.01	0.01	0.01	0.00
Dukes Cut to Farmoor				
Coastal and Floodplain Grazing Marsh	6.72	0.00	6.72	0.00
Arable	8.40	0.00	8.40	0.00
Pastoral	4.60	0.00	4.60	0.00
Hay Meadows	0.69	0.00	0.69	0.00
Active floodplain	11.95	11.95	11.95	0.00
Ponds and linear features	0.06	0.06	0.06	0.00
Mogden to Teddington outfall 75 Ml/d				
Broadleaved, Mixed and Yew Woodland	1.26	0.00	0.00	-1.26
Urban semi natural habitat	0.12	0.12	0.12	0.00
Active floodplain	1.80	1.80	1.50	-0.30

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Blue space	0.08	0.00	0.08	0.00
Ponds and linear features	0.04	0.04	0.04	0.00
Greenspace	1.77	0.00	1.51	-0.26
300: Unsupported flow				
Coastal and Floodplain Grazing Marsh	0.25	0.00	0.25	0.00
Arable	194.01	0.00	194.01	0.00
Pastoral	91.19	0.00	91.19	0.00
Orchards and Top Fruit	0.50	0.00	0.00	-0.50
Hay Meadows	1.42	0.00	1.42	0.00
Other semi-natural grassland	12.50	0.00	12.50	0.00
Broadleaved, Mixed and Yew Woodland	0.48	0.00	0.48	0.00
Coniferous Woodland	0.03	0.00	0.03	0.00
Ancient Woodland	0.05	0.00	0.00	-0.05
Greenspace	0.29	0.00	0.29	0.00
Active floodplain	50.66	50.66	50.66	0.00
Rivers	0.04	0.04	0.04	0.00
Ponds and linear features	0.03	0.03	0.03	0.00

Figures rounded to 2sp, those with '0.00*' have a very small value.

Table 3.6 : BESP- Quantitative detailed assessment of the unmitigated predicted permanent impacts on the provision of ecosystem services

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
SouthEast Water to Guildford					
Carbon storage	£2,413.89	£0.00	-£2,413.89	£1,695.22	-£718.67
Natural hazard management	£776.14	£0.00	-£776.14	£582.10	-£194.03
Air Pollutant Removal	£3,658.08	£0.00	-£3,658.08	£2,779.12	-£878.96
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£311,200.00	£311,011.00	£189.00	£311,011.00	-£189.00
Total	£318,048.10	£311,011.00	-£7,037.10	£316,067.44	-£1,980.66
Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD					
Carbon storage	£16.51	£0.00	£0.00	£0.00	-£16.51
Natural hazard management	£10.63	£0.00	£0.00	£0.00	-£10.63
Air Pollutant Removal	£92.52	£0.00	£0.00	£0.00	-£92.52
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£119.67	£0.00	£0.00	£0.00	-£119.67
T2ST Culham to Speen transfer					
Carbon storage	£38.99	£0.00	-£38.99	£35.12	-£3.86

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Natural hazard management	£9.95	£0.00	-£9.95	£7.46	-£2.49
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£48.93	£0.00	-£48.93	£42.58	-£6.35
River Thames to Fobney Transfer					
Carbon storage	£2,388.06	£0.00	-£2,388.06	£1,791.55	-£596.52
Natural hazard management	£115.90	£0.00	-£115.90	£86.93	-£28.98
Air Pollutant Removal	£335.75	£0.00	-£335.75	£251.82	-£83.93
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£2,839.71	£0.00	-£2,839.71	£2,130.29	-£709.42
Southfleet/Greenhithe (new WTW)					
Carbon storage	£270.56	£0.00	-£270.56	£234.84	-£35.71
Natural hazard management	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£270.56	£0.00	-£270.56	£234.84	-£35.71
ASR Horton Kirby					
Carbon storage	£1,423.66	£0.00	-£1,423.66	£1,274.03	-£149.63
Natural hazard management	£29.07	£0.00	-£29.07	£21.81	-£7.27
Air Pollutant Removal	£85.40	£0.00	-£85.40	£65.30	-£20.10
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£1,538.14	£0.00	-£1,538.14	-£1,361.14	-£177.00
Kempton - 150 - Construction					
Carbon storage	£1,074.81	£0.00	-£1,074.81	£781.33	-£293.47
Natural hazard management	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	£2,014.61	£0.00	-£2,014.61	£1,510.96	-£503.65
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£3,089.42	£0.00	-£3,089.42	£2,292.29	-£797.13
New Reservoir Abingdon 150 Mm3 - 283 MLD (Lon only) - Construction					
Carbon storage	£22,950.36	£0.00	-£22,950.36	£15t,151.77	-£7,798.59
Natural hazard management	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	£0.00	£0.00	£0.00	£270,842.00	£270,842.00
Food production	£1,700,000.00	£0.00	-£1,700,000.00	£1,460,900.00	-£239,100.00
Total	£1,722,950.36	£0.00	-£1,722,950.36	£1,746,893.77	£23,943.41

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Raw Water Transfer Deerhurst to Culham 300 Ml/d (Lon only) - Construction					
Carbon storage	£4,818.51	£0.00	-£4,818.51	£4,762.49	-£56.02
Natural hazard management	£49.62	£0.00	-£49.62	£33.89	-£15.73
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£4,868.13	£0.00	-£4,868.13	£4,826.38	-£71.75
Netheridge STW effluent diversion (35Mld) - Cotswold Canals					
Carbon storage	£29.30	£0.04	-£29.25	£29.28	-£0.01
Natural hazard management	£0.03	£0.03	£0.00	£0.02	-£0.01
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£29.32	£0.07	-£29.25	£29.30	-£0.02
Potential Henley resource for SWA					
Carbon storage	£417.56	£0.00	-£417.56	£351.52	-£66.04
Natural hazard management	£68.22	£0.00	-£68.22	£44.52	-£23.70
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£1,800,000.00	£1,799,620.00	-£380.00	£1,799,620.00	-£380.00
Total	£1,800,485.78	£1,799,620.00	-£865.78	£1,800,016.05	-£469.74
Henley to SWA – 5 Ml/d					
Carbon storage	£3,799.19	£18.24	-£3,780.95	£3,225.61	-£573.59
Natural hazard management	£68.22	£0.89	-£67.34	£47.84	-£20.38
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£1,800,000.00	£1,799,620.00	-£380.00	£1,799,620.00	-£380.00
Total	£1,803,867.41	£1,799,639.13	-£4,228.29	£1,802,893.45	-£973.96
SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA)					
Carbon storage	£1,814.71	£0.00	-£1,814.71	£1,686.81	-£127.90
Natural hazard management	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£4,600,000.00	£4,598,900.00	-£1,100.00	£4,598,900.00	-£1,100.00
Total	£4,601,814.71	£4,598,900.00	-£2,914.71	£4,600,586.81	-£1,227.90
Woods Farm Increase DO					
Carbon storage	£2,671.49	£0.00	-£2,671.49	£1,982.93	-£688.56
Natural hazard management	£80.63	£0.00	-£80.63	£47.18	-£33.45
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£2,752.11	£0.00	-£2,752.11	£2,030.11	-£722.00
Wessex Water to SWOX (Flaxlands)					
Carbon storage	£3,653.47	£0.00	-£3,653.47	£3,639.57	-£13.90
Natural hazard management	£2.66	£0.00	-£2.66	£1.99	-£0.66
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£3,656.13	£0.00	-£3,656.13	£3,641.56	-£14.57
Oxford Canal - Duke's Cut (SWOX) - Construction					
Carbon storage	£6,180.52	£0.00	-£6,180.52	£5,417.62	-£762.90
Natural hazard management	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	£7,085.07	£0.00	-£7,085.07	£5,744.46	-£1,340.61
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£13,265.59	£0.00	-£13,265.59	£11,162.08	-£2,103.51
Abingdon WTW Ph1 - Construction					
Carbon storage	£72.12	£0.00	-£75.12	£33.19	-£41.93
Natural hazard management	£2.66	£0.00	-£2.66	£1.99	-£0.66
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£804,100.00	£802,800.00	-£1,300.00	£802,800.00	-£1,300.00
Total	£804,177.78	£802,800.00	-£1,377.78	£802,835.19	-£1,342.59
Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR)					
Carbon storage	£706.32	£0.00	-£706.32	£669.49	-£36.83
Natural hazard management	£64.64	£0.00	-£64.68	£48.51	-£16.17
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£770.99	£0.00	-£770.99	£718.00	-£53.00
Dukes Cut to Farmoor					
Carbon storage	£223.48	£0.00	-£223.48	£223.48	£0.00
Natural hazard management	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£223.48	£0.00	-£223.48	£223.48	£0.00
Mogden to Teddington outfall 75 Ml/d					
Carbon storage	£174.72	£0.00	£5.78	£5.78	-£168.94
Natural hazard management	£111.64	£0.00	£10.63	£0.00	-£111.64
Air Pollutant Removal	£989.63	£0.00	£17.68	£0.00	-£989.34

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£1,275.70	£0.00	£34.29	£5.78	-£1,269.92
300: Unsupported flow					
Carbon storage	£4,818.51	£0.00	-£4,818.51	£4,792.49	-£26.02
Natural hazard management	£49.62	£0.00	-£49.62	£33.89	-£15.73
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£4,868.13	£0.00	-£4,868.13	£4,826.38	-£41.75

Table 3.7: BESP- Qualitative assessment of the unmitigated predicted impacts on the provision of water purification and water flow regulation

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
Water Purification				
- South East Water to Guildford - T2ST Culham to Speen transfer - River Thames to Fobney Transfer - Southfleet/Greenhithe (new WTW) - ASR Horton Kirby - Kempton - 150 – Construction - Netheridge STW effluent diversion (35Mld) - Cotswold Canals - SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA) - Potential Henley resource for SWA - Abingdon WTW Ph1 – Construction - Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR) - Dukes Cut to Farmoor - New Reservoir Abingdon 150 Mm3 - 283 MLD (Lon only) - Construction	The stock likely provides a high provision of the ecosystem service due to the natural capital asset's high capacity to store and absorb pollutants and the proximity of the asset to a water source.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely be reduced	The provision of water purification provided by the stock will likely be reduced due to the option.

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
- Mogden to Teddington outfall 75 Ml/d - 300: Unsupported flow - Raw Water Transfer Deerhurst to Culham 300 Ml/d (Lon only) - Construction				
- Henley to SWA – 5 Ml/d - Woods Farm Increase DO - Oxford Canal - Duke's Cut (SWOX) – Construction - Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD	The stock likely provides a high provision of the ecosystem service due to the natural capital asset's high capacity to store and absorb pollutants and the proximity of the asset to a water source.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely be reduced	The provision of water purification provided by the stock will likely be reduced due to the option. Future provision of ecosystem services provided by Ancient Woodland will be permanently lost as is a high value natural capital stock that cannot be replaced or replicated once lost.
Water Regulation				
- South East Water to Guildford - T2ST Culham to Speen transfer - River Thames to Fobney Transfer - Southfleet/Greenhithe (new WTW) - ASR Horton Kirby - Netheridge STW effluent diversion (35Mld) - Cotswold Canals - Henley to SWA – 5 Ml/d - SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA) - Woods Farm Increase DO - Oxford Canal - Duke's Cut (SWOX) – Construction - Potential Henley resource for SWA - Abingdon WTW Ph1 – Construction	The stocks provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The preservation of stocks will reduce negative impacts to the ecosystem service.	The provision of services will be retained during construction.	The future provision of the ecosystem service provided by the stock will likely remain.	0

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
- Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR) - Dukes Cut to Farmoor - Mogden to Teddington outfall 75 Ml/d - 300: Unsupported flow - Raw Water Transfer Deerhurst to Culham 300 Ml/d (Lon only) - Construction				
- Kempton - 150 - Construction	The stocks provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The preservation of stocks will reduce negative impacts to the ecosystem service.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely reduce slightly.	-
- Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD - New Reservoir Abingdon 150 Mm3 - 283 MLD (Lon only) - Construction	The stocks provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The loss of stocks will increase negative impacts to the ecosystem service.	The provision of water flow regulation services of contributing stocks will be lost during construction. However, the addition of a reservoir will bring additional water flow regulation to the environment.	The loss of contributing stocks has the potential to impede water flow on site. The addition of a reservoir will regulate flows, control water movement and maintain water supplies in dry periods, enabling a resilient supply of water to consumers, however the loss of existing stocks will require a Level 2 WFD. As such, the impact of the option on water flow regulation cannot be assessed at this stage.	+++

Table 3.8 : BESP- Summary of the unmitigated BNG Metric outputs

Natural capital stock	On-site Baseline (Habitat BU)	On-Site Post Intervention (Habitat BU)	Total Net Unit change (Habitat BU)	Total Percentage Change (Habitat BU)
SouthEast Water to Guildford	255.40	72.38	-183.02	-71.66%
Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD	2.38	0.00	-2.38	-100.00%
T2ST Culham to Speen transfer	10.82	6.75	-4.07	-37.61%
River Thames to Fobney Transfer	51.57	9.02	-42.55	-82.51%
Southfleet/Greenhithe (new WTW)	37.18	21.26	-15.92	-42.82%
ASR Horton Kirby	15.19	8.25	-6.94	-45.67%
Kempton - 150 - Construction	157.34	21.57	-135.77	-86.29%
New Reservoir Abingdon 150 Mm3 - 283 MLD (Lon only) - Construction	4969.76	7356.69	2386.93	48.03%
Raw Water Transfer Deerhurst to Culham 300 Ml/d (Lon only) - Construction	1036.09	746.96	-289.13	-27.12%
Netheridge STW effluent diversion (35Mld) - Cotswold Canals	16.77	6.10	-10.67	-63.62%
Potential Henley resource for SWA	74.18	50.62	-23.57	-31.77%
Henley to SWA – 5 Ml/d	55.76	47.09	-8.67	-15.55%
SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA)	523.97	283.53	-240.45	-45.89%
Woods Farm Increase DO	25.00	15.83	-9.17	-36.67%
Wessex Water to SWOX (Flaxlands)	113.96	13.32	-100.64	-88.31%
Oxford Canal - Duke's Cut (SWOX) - Construction	2607.62	2057.43	-550.20	-21.10%
Abingdon WTW Ph1 - Construction	22.18	6.87	-15.30	-69.01%
Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR)	188.19	95.90	-92.29	-49.04%
Dukes Cut to Farmoor	201.30	65.77	-135.53	-67.33%
Mogden to Teddington outfall 75 Ml/d	17.69	2.60	-15.09	-85.30%
300: Unsupported flow	1036.09	746.96	-289.13	-27.91%

Best Value Plan

Table 3.9 : BVP - Predicted Impacts on natural capital stocks

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
South East Water to Guildford				
Arable	12.56	0.00	11.96	-0.60
Pastoral	2.93	0.00	2.93	0.00
Other Semi-Natural Grassland	4.36	0.00	4.36	0.00

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Broadleaved, Mixed and Yew Woodland	3.43	0.00	3.43	0.00
Coniferous Woodland	2.79	0.00	2.79	0.00
Bluespace	0.06	0.06	0.06	0.00
Greenspace	0.33	0.0	0.33	0.00
Urban Woodland	2.54	0.00	2.54	0.00
River Thames to Fobney Transfer				
Coastal and Floodplain Grazing Marsh	2.45	0.00	2.45	0.00
Pastoral	0.01	0.00	0.01	0.00
Woodland Priority Habitat	1.28	0.00	1.28	0.00
Greenspace	0.34	0.00	0.34	0.00
Urban Semi Natural Habitat	0.01	0.00	0.01	0.00
Urban Woodland	0.03	0.00	0.03	0.00
Active Flood Plain	3.97	3.97	3.97	0.00
Rivers (length)	332.40	332.40	332.40	0.00
Ponds and Linear Features	0.04	0.04	0.04	0.00
Southfleet/Greenhithe (new WTW)				
Arable	5.68	0.00	5.68	0.00
Pastoral	2.43	0.00	2.43	0.00
Broadleaved, Mixed and Yew Woodland	1.04	0.00	1.04	0.00
Ponds and Linear Features	0.02	0.02	0.02	0.00
Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD				
Broadleaved Mixed Woodland	0.12	0.00	0.00	-0.12
Active Floodplain	0.05	0.00	0.00	-0.05
Lakes and standing waters	0.00	0.00	1.00	1.00
Modified Waters (Reservoirs)	0.00	0.00	2.00	2.00
ASR Horton Kirby				
Arable	0.36	0.00	0.36	0.00
Pastoral	2.28	0.00	2.28	0.00
Broadleaved, Mixed and Yew Woodland	0.01	0.00	0.01	0.00
Woodland Priority Habitats	0.33	0.00	0.33	0.00
Active Flood Plain	1.20	1.20	1.20	0.00
Kempton - 150 - Construction				
Broadleaved, Mixed and Yew Woodland	7.09	0.00	7.09	0.00
Urban Woodland	0.36	0.00	0.36	0.00
Lakes and Standing Waters	2.17	0.00	0.00	-2.17

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Ponds and Linear Features	0.81	0.00	0.00	-0.81
Reservoir Abingdon 100 (Lon) - Construction				
Coastal and Floodplain Grazing Marsh	68.01	0.00	93.73	25.72
Arable	1218.55	0.00	786.17	-432.38
Pastoral	52.20	0.00	0.00	-52.20
Orchards and Top Fruit	0.18	0.00	0.00	-0.18
Broadleaved, Mixed and Yew Woodland	36.76	0.00	54.51	17.75
Coniferous Woodland	2.21	0.00	0.00	-2.21
Active Flood Plain	351.18	93.73	93.73	-257.45
Lakes and Standing Waters	0.00	495.26	495.26	495.26
Ponds and Linear Features	2.68	2.68	6.41	3.73
Raw Water Transfer Deerhurst to Culham 500 Ml/d (Lon only) - Construction				
Coastal and Floodplain Grazing Marsh	0.25	0.00	0.25	0.00
Arable	194.01	0.00	194.01	0.00
Pastoral	91.19	0.00	91.19	0.00
Orchards and Top Fruit	0.50	0.00	0.00	-0.50
Hay Meadows	1.42	0.00	1.42	0.00
Other semi-natural grassland	12.50	0.00	12.50	0.00
Broadleaved, Mixed and Yew Woodland	0.48	0.00	0.48	0.00
Coniferous Woodland	0.03	0.00	0.03	0.00
Ancient Woodland	0.05	0.00	0.00	-0.05
Greenspace	0.29	0.00	0.29	0.00
Active flood plain	50.66	50.66	50.66	0.00
Rivers	0.04	0.04	0.04	0.00
Ponds and linear features	0.03	0.03	0.03	0.00
500: Vyrnwy Reservoir river release (75 Mld) and 25 Mld of Bypass (105Mld)				
Arable	8.51	0.00	8.51	0.00
Pastoral	60.12	0.00	57.98	-2.14
Orchards and Top Fruit	0.0003	0.0003	0.0003	0.00
Other semi-natural grassland	1.06	0.00	1.06	0.00
Broadleaved, Mixed and Yew Woodland	0.01	0.00	0.01	0.00
Greenspace	0.001	0.00	0.001	0.00

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Rivers	0.15	0.15	0.15	0.00
Ponds and linear features	0.06	0.06	0.06	0.00
500: Netheridge STW effluent diversion (35Mld) - Deerhurst Pipeline				
Coastal and Floodplain Grazing Marsh	0.50	0.00	0.50	0.00
Pastoral	0.95	0.00	0.95	0.00
Other Semi-Natural Grassland	0.34	0.00	0.34	0.00
Broadleaved, Mixed and Yew Woodland	0.0003	0.0003	0.0003	0.0003
Bluespace	0.02	0.02	0.02	0.00
Greenspace	0.27	0.00	0.27	0.00
Active Flood Plain	3.16	3.16	3.16	0.00
Rivers (length)	0.10	0.10	0.10	0.00
Ponds and Linear Features	0.01	0.01	0.01	0.00
SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA)				
Coastal and Floodplain Grazing Marsh	5.33	0.00	5.33	0.00
Arable	53.51	0.00	52.07	-1.44
Pastoral	40.08	0.00	37.20	-2.88
Hay Meadows	0.43	0.43	0.43	0.00
Other Semi-Natural Grassland	0.56	0.00	0.56	0.00
Broadleaved, Mixed and Yew Woodland	0.89	0.00	0.89	0.00
Coniferous Woodland	0.05	0.00	0.05	0.00
Ancient Woodland	0.0001	0.0001	0.0001	0.00
Active Flood Plain	19.62	19.62	19.62	0.00
Ponds and Linear Features	0.07	0.07	0.07	0.00
Woods Farm Increase DO				
Arable	3.28	0.00	3.28	0.00
Pastoral	2.48	0.00	2.48	0.00
Other Semi-Natural Grassland	0.000001	0.00	0.000001	0.00
Broadleaved, Mixed and Yew Woodland	0.71	0.00	0.71	0.00
Ancient Woodland	0.20	0.00	0.00	-0.20
Active Flood Plain	0.33	0.33	0.33	0.00
Wessex Water to SWOX (Flaxlands)				
Arable	1.36	0.00	1.36	0.00
Pastoral	22.28	0.00	22.28	0.00
Hay Meadows	0.48	0.00	0.48	0.00
Other Semi-Natural Grassland	1.17	0.00	1.17	0.00

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Broadleaved, Mixed and Yew Woodland	0.03	0.00	0.03	0.00
Active Flood Plain	0.87	0.87	0.87	0.00
Ponds and Linear Features	0.02	0.02	0.02	0.00
Abingdon WTW Ph1 - Construction				
Coastal and Floodplain Grazing Marsh	0.37	0.00	0.37	0.00
Arable	6.36	0.00	2.64	-3.72
Pastoral	0.04	0.00	0.04	0.00
Broadleaved, Mixed and Yew Woodland	0.03	0.00	0.03	0.00
Active Flood Plain	0.86	0.86	0.86	0.00
Ponds and Linear Features	0.01	0.01	0.01	0.00
Mogden to Teddington outfall 75 Ml/d				
Broadleaved Mixed Woodland	1.26	0.00	0.00	-1.26
Urban Semi Natural Habitats	0.12	0.13	0.12	0.00
Active Flood Plain	1.80	2.80	1.50	-0.30
Blue Space	0.08	0.00	0.08	0.00
Ponds and Linear Features	0.04	0.01	0.04	0.00
Greenspace	1.77	0.00	1.51	-0.26
Abingdon WTW Enhanced				
Coastal and Floodplain Grazing Marsh	0.37	0.00	0.37	0.00
Arable	6.36	0.00	2.64	-3.72
Pastoral	0.04	0.00	0.04	0.00
Broadleaved, Mixed and Yew Woodland	0.03	0.00	0.03	0.00
Active Flood Plain	0.86	0.86	0.86	0.00
Ponds and Linear Features	0.01	0.01	0.01	0.00
Henley to SWOX – 5 Ml/d				
Arable	0.63	0.00	0.63	0.00
Pastoral	5.48	0.00	4.56	-0.92
Other Semi-Natural Grassland	0.03	0.00	0.03	0.00
Broadleaved, Mixed and Yew Woodland	3.54	0.00	3.54	0.00
Coniferous Woodland	0.04	0.00	0.04	0.00
Ancient Woodland	1.56	0.00	0.00	-1.56
Urban Woodland	0.22	0.00	0.22	0.00
Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR)				

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Coastal and Floodplain Grazing Marsh	2.29	0.00	2.29	0.00
Arable	10.51	0.00	10.51	0.00
Pastoral	16.47	0.00	16.47	0.00
Hay Meadows	0.10	0.00	0.10	0.00
Broadleaved, Mixed and Yew Woodland	0.51	0.00	0.51	0.00
Coniferous Woodland	0.22	0.00	0.22	0.00
Active Flood Plain	4.51	4.51	4.51	0.00
Ponds and Linear Features	0.01	0.01	0.01	0.00
500: Unsupported flow				
Coastal and Floodplain Grazing Marsh	0.25	0.00	0.25	0.00
Arable	194.01	0.00	194.01	0.00
Pastoral	91.19	0.00	91.19	0.00
Orchards and Top Fruit	0.50	0.00	0.00	-0.50
Hay Meadows	1.42	0.00	1.42	0.00
Other Semi-Natural Grassland	12.50	0.00	12.50	0.00
Broadleaved, Mixed and Yew Woodland	0.48	0.00	0.48	0.00
Coniferous Woodland	0.03	0.00	0.03	0.00
Ancient Woodland	0.05	0.00	0.00	-0.05
Greenspace	0.29	0.00	0.29	0.00
Active Flood Plain	50.66	50.66	50.66	0.00
Rivers (length)	0.04	0.00	0.04	0.00
Ponds and Linear Features	0.03	0.03	0.03	0.00

Table 3.10: BVP - Quantitative detailed assessment of the unmitigated predicted permanent impacts on the provision of ecosystem services

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
SouthEast Water to Guildford					
Carbon storage	2,413.89	0.00	-2,413.89	1,695.22	-718.67
Natural hazard management	776.14	0.00	776,14	582.10	-194.03
Air Pollutant Removal	3,658.08	0.00	3,658.08	2,779.12	-878.96

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	311,200.00	311,011.00	-189.00	311,011.00	-189.00
Total	318,048.11	311,011.00	1,055.19	316,067.44	-1,980.66
River Thames to Fobney Transfer					
Carbon storage	2,388.06	0.00	-2,388.06	1,792.55	-596.52
Natural hazard management	115.90	0.00	-115.90	86.93	-28.98
Air Pollutant Removal	335.75	0.00	-335.75	251.82	-83.93
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Total	2,839.71	0.00	-2,839.71	2,131.30	-709.42
Southfleet/Greenhithe (new WTW)					
Carbon storage	270.56	0.00	-270.56	234.84	-35.71
Natural hazard management	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Total	270.56	0.00	-270.56	234.84	-35.71
Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD					
Carbon storage	£16.51	£0.00	£0.00	£0.00	-£16.51
Natural hazard management	£10.63	£0.00	£0.00	£0.00	-£10.63
Air Pollutant Removal	£92.52	£0.00	£0.00	£0.00	-£92.52
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£119.67	£0.00	£0.00	£0.00	-£119.67
ASR Horton Kirby					
Carbon storage	1,423.66	0.00	-1,423.66	1,274.03	-149.63
Natural hazard management	29.07	0.00	-29.07	21.81	-7.27
Air Pollutant Removal	85.40	0.00	-85.40	65.30	-20.10
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Food production	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Total	1,538.13	0.00	-1,538.13	1,361.14	-177.00
Kempton - 150 - Construction					
Carbon storage	1,074.81	0.00	-1,074.81	781.33	-293.47
Natural hazard management	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Air Pollutant Removal	2,014.61	0.00	-2,014.61	1,510.96	-503.65
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Total	3,089.42	0.00	-3,089.42	2,292.29	-797.12
Reservoir Abingdon 100 (Lon) - Construction					
Carbon storage	20,631.10	0.00	-20,631.10	16,427.61	-4,203.49
Natural hazard management	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation & amenity value	0.00	0.00	0.00	249,021.00	249,021.00
Food production	1,700,000.00	0.00	-1,700,000.00	1,557,400.00	-142,600.00
Total	1,720,631.10	0.00	-1,720,631.10	1,822,848.61	102,217.51
Raw Water Transfer Deerhurst to Culham 500 Ml/d (Lon only) - Construction					
Carbon storage	£4,818.51	£0.00	-£4,818.51	£4,762.49	-£56.02
Natural hazard management	£49.62	£0.00	-£49.62	£33.89	-£15.73
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Total	£4,868.13	£0.00	-£4,868.13	£4,796.38	-£71.75
500: Vyrnwy Reservoir river release (75 Mld) and 25 Mld of Bypass (105Mld)					
Carbon storage	£1,721.36	£0.00	-£1,721.36	£1,663.54	-£57.82
Natural hazard management	£0.89	£0.00	-£0.89	£0.66	-£0.22
Air Pollutant Removal	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Recreation & amenity value	Scoped Out	Scoped Out	Scoped Out	Scoped Out	Scoped Out
Food production	£23,000,000.00	£22,999,186.00	-£814.00	£22,999,186.00	-£814.00

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Total	£23,001,722.25	£22,999,186.00	-£2,536.25	£23,000,850.20	-£872.04
500: Netheridge STW effluent diversion (35Mld) - Deerhurst Pipeline					
Carbon storage	29.30	0.04	-29.25	29.28	-0.01
Natural hazard management	0.03	0.03	0.00	0.02	-0.01
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Total	29.33	0.07	-29.25	29.30	-0.02
SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA)					
Carbon storage	1,814.71	0.00	-1,814.71	1,686.81	-127.90
Natural hazard management	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	4,600,000.00	4,598,900.00	-1,100.00	4,598,900.00	-1,100.00
Total	4,601,814.71	4,598,900.00	-2,914.71	4,600,586.81	-1,227.90
Woods Farm Increase DO					
Carbon storage	2,671.49	0.00	-2,671.49	1,982.93	-688.56
Natural hazard management	80.63	0.00	-80.63	47.18	-33.45
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Total	2,752.11	0.00	-2,752.11	2,030.11	-722.00
Wessex Water to SWOX (Flaxlands)					
Carbon storage	3,653.47	0.00	-3,653.47	3,639.57	-13.90
Natural hazard management	2.66	0.00	-2.66	1.99	-0.66
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Total	3,656.13	0.00	-3,656.13	3,641.56	-14.57
Abingdon WTW Ph1 - Construction					

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Carbon storage	75.12	0.00	-75.12	33.19	-41.93
Natural hazard management	2.66	0.00	2.66	1.99	0.66
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	804,100.00	802,800.00	-1,300.00	802,800.00	-1,300.00
Total	804,177.78	802,800.00	-1,372.46	802,835.18	-1,341.27
Mogden to Teddington outfall 75 Ml/d					
Carbon storage	174.72	0.00	£5.78	5.78	-168.94
Natural hazard management	111.64	0.00	£10.63	0.00	-111.64
Air Pollutant Removal	989.34	0.00	£17.68	0.00	-989.34
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Total	1,275.70	0.00		5.78	-1,269.92
Abingdon WTW Enhanced					
Carbon storage	75.12	0.00	-75.12	33.19	-41.93
Natural hazard management	2.66	0.00	2.66	1.99	-0.66
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	802,800.00	802,800.00	0.00	802,800.00	0.00
Total	802,877.78	802,800.00	-72.46	802,835.18	-42.59
Henley to SWOX – 5 Ml/d					
Carbon storage	11,869.41	0.00	-11,869.41	6,935.46	-4,933.95
Natural hazard management	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	271,500.00	271,001.00	-499.00	271,001.00	-499.00
Total	283,369.41	271,001.00	-12,368.41	277,936.46	-5,432.95
Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR)					
Carbon storage	706.32	0.00	-706.32	669.49	-36.83

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Natural hazard management	64.68	0.00	-64.68	48.51	-16.17
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Total	771.00	0.00	-771.00	718.00	-53.00
500: Unsupported flow					
Carbon storage	4,818.51	0.00	-4,818.51	4,792.49	-26.02
Natural hazard management	49.62	0.00	-49.62	33.89	-15.73
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Total	4868.13	0.00	-4,868.13	4,826.38	-41.75

Table 3.11 : BVP - Qualitative assessment of the unmitigated predicted impacts on the provision of water purification and water flow regulation

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
Water Purification				
• South East Water to Guildford • ASR Horton Kirby • SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA) • 500: Unsupported Flow • Woods Farm Increase DO • Henley to SWOX – 5 Ml/d • Raw Water Transfer Deerhurst to Culham 300	The stock likely provides a high provision of the ecosystem service due to the natural capital asset's high capacity to store and absorb pollutants and the proximity of the asset to a water source.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely be reduced	The provision of water purification provided by the stock will likely be reduced due to the option.

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
Ml/d (Lon only) – Construction • 500: Vyrnwy Reservoir river release (75 Mld) and 25 Mld of Bypass (105Mld)				
	The stock likely provides a high provision of the ecosystem service due to the natural capital asset's high capacity to store and absorb pollutants and the proximity of the asset to a water source.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely be reduced	The provision of water purification provided by the stock will likely be reduced due to the option. Future provision of ecosystem services provided by Ancient Woodland will be permanently lost as is a high value natural capital stock that cannot be replaced or replicated once lost.
Water Regulation				
• Wessex Water to SWOX (Flaxlands) • Raw Water Transfer Deerhurst to Culham 300 Ml/d (Lon only) – Construction • 500: Vyrnwy Reservoir river release (75 Mld) and 25 Mld of Bypass (105Mld)	The stocks provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The preservation of stocks will reduce negative impacts to the ecosystem service.	The provision of services will be retained during construction.	The future provision of the ecosystem service provided by the stock will likely remain.	0

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
• Guildford to Reigate Reverse Direction: 20Ml/d	The stocks provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The preservation of stocks will reduce negative impacts to the ecosystem service.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely reduce slightly.	-
	The stocks provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The loss of stocks will increase negative impacts to the ecosystem service.	The provision of water flow regulation services of contributing stocks will be lost during construction. However, the addition of a reservoir will bring additional water flow regulation to the environment.	The loss of contributing stocks has the potential to impede water flow on site. The addition of a reservoir will regulate flows, control water movement and maintain water supplies in dry periods, enabling a resilient supply of water to consumers, however the loss of existing stocks will require a Level 2 WFD. As such, the impact of the option on water flow regulation cannot be assessed at this stage.	+++

Table 3.12 : BVP - Summary of the unmitigated BNG Metric outputs

Natural capital stock	On-site Baseline (Habitat BU)	On-Site Post Intervention (Habitat BU)	Total Net Unit change (Habitat BU)	Total Percentage Change (Habitat BU)
SouthEast Water to Guildford	255.40	72.38	-183.02	-71.66%
River Thames to Fobney Transfer	51.57	9.02	-42.55	-82.51%
Southfleet/Greenhithe (new WTW)	37.18	21.26	-15.92	-42.82%

Natural capital stock	On-site Baseline (Habitat BU)	On-Site Post Intervention (Habitat BU)	Total Net Unit change (Habitat BU)	Total Percentage Change (Habitat BU)
Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD	2.38	0.00	-2.38	-100.00%
ASR Horton Kirby	15.19	8.25	-6.94	-45.67%
Kempton - 150 - Construction	157.34	21.57	-135.77	-89.29%
Reservoir Abingdon 100 (Lon) - Construction	4489.28	5706.98	1217.70	27.12%
Raw Water Transfer Deerhurst to Culham 500 Ml/d (Lon only) - Construction	1036.09	746.96	-289.13	-27.12%
500: Vyrnwy Reservoir river release (75 Mld) and 25 Mld of Bypass (105Mld)	298.17	199.80	-98.38	-32.99%
500: Netheridge STW effluent diversion (35Mld) - Deerhurst Pipeline	16.77	6.10	-10.67	-63.62%
SWOX to SWA (Abingdon WTW to Long Crendon to supply SWA)	523.97	283.53	-240.45	-45.89%
Woods Farm Increase DO	25.00	15.83	-9.17	-36.67%
Wessex Water to SWOX (Flaxlands)	113.96	13.32	-100.64	-88.31%
Abingdon WTW Ph1 - Construction	22.18	6.87	-15.30	-69.01%
Mogden to Teddington outfall 75 Ml/d	17.69	2.60	-15.09	-85.30%
Abingdon WTW Enhanced	22.18	6.87	-15.30	-69.01%
Henley to SWOX – 5 Ml/d	67.94	22.69	-45.25	-66.61%
Abingdon to Farmoor Reservoir pipeline (CON-RWS-ABI-FMR)	188.19	95.90	-92.29	-49.04%
500: Unsupported flow	1036.09	746.96	-289.13	-27.91%

4 Cumulative Effects Assessment

4.1 Introduction

The final stage in NCA is the cumulative effects assessment, including both intra-plan and inter-plan effects, to inform Thames Water's WRMP24 programme appraisal.
This chapter provides a summary of the outputs of the cumulative effects assessment for both the NCA and BNG of Thames Water's WRMP24 BVP options.

4.2 Methodology

For NCA and BNG, the cumulative effects assessment only considers the BVP options and does not include an assessment of the alternative plans. The cumulative intra-plan effects assessment for the Best Value Plan considers the option assessments as a whole and the habitat units that would be required to be purchased in order to achieve a 10% net gain in BNG. This provides an estimate of the value of the potential mitigation or enhancement opportunities that will need to be developed further to achieve the 10% BNG required within the options. Additionally, where possible, the Best Value Plan could aim to not only reinstate lost habitat, but also provide a greater or more diverse habitat than is lost, to achieve overall BNG in line with regulatory requirements for BNG (at the time of the project consenting) as stated as a mandatory requirement within the Environment Act 2021. The latter could be achieved by identifying local sites of ecological interest and proposing measures which enhance these features.
The cumulative inter-plan effects assessment for NCA and BNG considers the major planning applications, allocations, and major projects, that have been reviewed as part of the project, in conjunction with the Best Value Plan, and provides a high-level overview of the potential impacts, mitigation and enhancement opportunities to increase BNG and the provision of ecosystem services.

4.3 Cumulative Intra-plan Effects Assessment

Table 4.1 lists the stocks of natural capital that are likely to be temporarily and permanently impacted by the BVP. The BVP is likely to generate the loss of natural capital stocks during construction. However, some habitat that is expected to be reinstated and/or compensated to pre-construction conditions following best practice technique will likely have no permanent impact to the provision of ecosystem services.

Broadleaved/mixed/yew/priority/coniferous/urban woodland have a significant maturity time with a delay of 30 years. Therefore, this delay is considered within potential future provision of this stock through the ecosystem services assessment. This can be accounted to the tree mortality rate presumed after woodland areas are replanted.

Table 4.1 : Predicted temporary and permanent cumulative effects on natural capital stocks for the BVP

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present during construction (Ha)	Stocks present post construction (Ha)	Change (Ha)
Arable	1715.69	0.00	1273.83	-441.86
Pastoral	390.17	0.00	332.03	-58.14
Other semi-natural grassland	32.52	0.00	32.52	0.00

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present during construction (Ha)	Stocks present post construction (Ha)	Change (Ha)
Broadleaved, Mixed and Yew Woodland	56.42	0.00	72.79	16.37
Coniferous Woodland	5.37	0.00	3.16	-2.21
Bluespace	0.16	0.16	0.16	0.00
Greenspace	3.29	0.00	3.03	-0.26
Urban Woodland	3.15	0.00	3.15	0.00
Active floodplain	489.73	223.23	231.93	-257.80
Lakes and standing waters	2.17	495.26	496.26	494.09
Woodland Priority Habitat	1.61	0.00	1.61	0.00
Coastal and Floodplain Grazing Marsh	79.82	0.00	105.54	25.72
Urban semi-natural woodland	0.13	0.13	0.13	0.00
Rivers	332.73	332.69	332.73	0.00
Ponds and linear features	3.84	3.00	6.76	2.92
Orchards and Top Fruit	1.18	0.00	0.00	-1.18
Ancient Woodland	1.86	0.00	0.00	-1.86
Modified Waters (Reservoirs)	0.00	0.00	2.00	2.00
Hay Meadows	3.85	0.43	3.85	0.00

Construction impacts for the BVP include the release of CO2 due to habitat clearance, loss of natural hazard management, a reduction in food production services, an increase in recreational and amenity services, and a reduction in water purification (Table 4.2 and Table 4.3). There is some change anticipated in water flow regulation (Table 4.3), however the change is expected to bring additional water flow regulation to the environment due to the addition of a reservoir. The BVP presents an opportunity to improve the existing habitats through post construction remediation and replacement of low value habitats with higher value habitats. The plan crosses several Natural England Habitats Network Enhancement Zones and is therefore suitable for the planting of new high value habitats.

Table 4.2 : Quantitative detailed assessment of the unmitigated predicted permanent impacts on the provision of ecosystem services for the BVP

Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Carbon storage	£273,878.91	£82.93	-£273,795.99	£224,425.91	-£49,453.00

Ecosystem services	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Natural hazard management	£6,061.13	£0.00	-£6,061.13	£5,363.18	-£697.95
Air Pollutant Removal	£42,456.38	£19.37	-£42,437.01	£33,926.13	-£8,530.25
Recreation and amenity value	£0.00	£0.00	£0.00	£249,021.00	£249,021.00
Food production	£31,489,600.00	£29,785,698.00	-£1,703,602.00	£31,343,098.00	-£146,502.00
Total	£31,811,996.42	£29,785,800.30	-£2,026,196.12	£31,901,023.22	£89,026.80

The BVP is likely to result in a reduction in water purification as seen in Table 4.3 . Three options, Woods Farm Increase DO, Henley to SWOX – 5 Ml/d and 500: Unsupported flow, result in the loss of Ancient Woodland (on a precautionary basis based on the level of information developed for the options to date) and as a result cannot be replaced.

The Water Flow Regulation assessment was a qualitative assessment and as such monetary values cannot be derived. Table 4.3 evidence impacts are likely to be neutral-negative.

Table 4.3 : Qualitative assessment of the unmitigated predicted impacts on the provision of water purification and water flow regulation for the BVP

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
Water Purification				
BVP	The stock likely provides a high provision of the ecosystem service due to the natural capital asset's high capacity to store and absorb pollutants and the proximity of the asset to a water source.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely be reduced	The provision of water purification provided by the stock will likely be reduced due to the option. Future provision of ecosystem services provided by Ancient Woodland will be permanently lost as is a high value natural capital stock that cannot be replaced or replicated once lost.

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
Water flow regulation				
BVP	The stocks provide a regulation of water flow, both retaining water within the catchment and providing water to local communities. The loss of stocks will increase negative impacts to the ecosystem service.	The provision of water flow regulation services of contributing stocks will be lost during construction. However, the addition of a reservoir will bring additional water flow regulation to the environment.	The loss of contributing stocks has the potential to impede water flow on site. The addition of a reservoir will regulate flows, control water movement and maintain water supplies in dry periods, enabling a resilient supply of water to consumers, however the loss of existing stocks will require a Level 2 WFD. As such, the impact of the option on water flow regulation cannot be assessed at this stage.	+++

The BVP is expected to result in -15.97% net loss of biodiversity units (Table 4.4). This is a result of most options generating a net loss of biodiversity, apart from the 100Mm^3 Abingdon reservoir. It should be noted that the desk-based BNG assessments have been carried out using open-source data. Habitat identification will need to be refined at the project level with both habitat survey data and further development of habitat mitigation / enhancement proposals. The number of units required to achieve a 10% BNG has also been presented in Table 4.4 below.

Table 4.4 : Summary of the unmitigated BNG Metric outputs for the BVP and the BNG habitat units required to be purchased to achieve 10% BNG

On-site Baseline (BU)	On-Site Post Intervention (BU)	Total Net Unit change (BU)	Total Percentage Change	BNG habitat unit purchase
7004.98	5886.20	-1118.78	-15.97%	1819.28

5 Options post-2050

5.1 Introduction

This Chapter provides a summary of the BNG assessments and NCA for BVP options that come online post-2050.

Outline of tables for options post-2050 in this Chapter:

- Table 5.1 - Options post-2050
- Table 5.2 - Predicted impacts on natural capital stocks
- Table 5.3 - Quantitative detailed assessment of the unmitigated predicted permanent impacts on the provision of ecosystem services
- Table 5.4 - Qualitative assessment of the unmitigated predicted impacts on the provision of water purification and water flow regulation
- Table 5.5 - Summary of the unmitigated BNG Metric outputs

Table 5.1 Options post-2050

Option	Type	Description / Notes
TWU_GUI_RE-DRP_ALL_ALL_dp-shalford-guild	Drought Permit	Scoped out.
TWU_KGV_HI-REU_RE1_CNO_deephams reuse 46.5b	London Reuse	**Deephams Reuse – 46.5Ml/d:** Transfer of Deephams STW Final effluent to the new water reuse works with the following technology: pre-screens, UF (different from the MF used in Atkins), RO, UV treatment, inter-process pumping, buildings and disinfection, pH adjustment chemicals.
TWU_LON_HI-GRW_ALL_ALL_merton recommission	Supply-side Option	**Merton Recommissioning:** This option comprises the recommissioning and upgrade of the Merton Abbey WTW in order to treat the maximum peak DO of 8Ml/d from the Merton Abbey Well. DO benefit 7.86 Ml/d peak 2 Ml/d average.
TWU_LON_HI-ROC_WT1_CNO_kemptonwtw100 p1	Supply-side Option	**Kempton – 100 Phase 1 – Construction:** Phase 1 Construction of new water treatment capacity of 100 Ml/d capacity within the Kempton WTW land boundary on land owned by Thames Water. The new treatment capacity will be used to supply the London water resource zone.
TWU_STT_HI-RAB_RE1_ALL_p10-500-vyrnwy_180_b	STT	Scoped out.
TWU_STT_HI-RAB_RE1_ALL_p7-500-vyrnwy_135_b	STT	Scoped out.
TWU_STT_HI-RAB_RE1_ALL_p8-500-vyrnwy_155_b	STT	Scoped out.
TWU_STT_HI-REU_RE1_ALL_p11-500-min_115_p2	STT	Scoped out.
TWU_STT_HI-REU_RE1_ALL_p7-500-minworth_115	STT	Scoped out.

Table 5.2 Options post-2050 - Predicted impacts on natural capital Stocks

Natural capital stock	Area within option boundary pre-construction (Ha)	Stocks present within option boundary during construction (Ha)	Stocks present within option boundary post construction (Ha)	Change (Ha)
Deephams Reuse – 46.5Ml/d				
Broadleaved, Mixed and Yew Woodland	1.19	0.00	1.19	0.00
Active Flood Plain	0.35	0.35	0.35	0.00
Ponds and linear features	0.03	0.03	0.03	0.00
Merton Recommissioning				
Further NCA and BNG Assessment has been scoped out due to the option type and available option information. The option is not expected to generate any land use change or direct impacts on natural capital. Any additional impacts within the option ZoI will be captured within the SEA, WFD & resilience assessment.				
Kempton – 100 Phase 1 – Construction				
Broadleaved, Mixed and Yew Woodland	7.09	0.00	7.09	0.00
Urban Woodland	0.36	0.00	0.36	0.00
Lakes and Standing Waters	2.17	0.00	0.00	-2.17
Ponds and linear features	0.81	0.00	0.00	-0.81

Table 5.3 Options post-2050 - Quantitative detailed assessment of the unmitigated predicted permanent impacts on the provision of ecosystem services

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Deephams Reuse – 46.5Ml/d					
Carbon storage	163.77	0.00	-163.77	122.83	-40.94
Natural hazard management	105.43	0.00	-105.43	79.08	-26.36
Air Pollutant Removal	291.55	0.00	-291.55	218.66	-72.89
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Total	560.75	0.00	-560.75	420.56	-140.19
Merton Recommissioning					
Carbon storage	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Natural hazard management	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Air Pollutant Removal	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Total					
Kempton – 100 Phase 1 – Construction					
Carbon storage	1,074.81	0.00	-1,074.81	781.33	-293.47
Natural hazard management	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Air Pollutant Removal	2,014.61	0.00	-2,014.61	1,510.96	-503.65

Natural capital stock	Baseline value (£/year)	Estimated value post construction (£/year)	Temporary impact from construction (£/year)	Total future value (£/year)	Overall change in value (£/year)
Recreation & amenity value	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Food production	Scoped out	Scoped out	Scoped out	Scoped out	Scoped out
Total	3,089.42	0.00	-3,089.42	2,292.29	-797.13

Table 5.4 Options post-2050 - Qualitative assessment of the unmitigated predicted impacts on the provision of water purification and water flow regulation

Option	Likely baseline provision	Construction impacts	Likely future provision	Overall change in provision
Water Purification				
Kempton – 100 Phase 1 – Construction Deephams Reuse – 46.5 Ml/d	The stock likely provides a high provision of the ecosystem service due to the natural capital asset's high capacity to store and absorb pollutants and the proximity of the asset to a water source.	The provision of services will be lost during construction.	The future provision of the ecosystem service provided by the stock will likely be reduced	The provision of water purification provided by the stock will likely be reduced due to the option.

Table 5.5 Options post-2050 - Summary of the unmitigated BNG Metric outputs

Natural capital stock	On-site Baseline (BU*)	On-Site Post Intervention (BU)	Total Net Unit change (BU)	Total Percentage Change
Deephams Reuse – 46.5Ml/d	16.3	3.96	-12.34	-75.71%
Merton Recommissioning	Scoped out	Scoped out	Scoped out	Scoped out
Kempton – 100 Phase 1 – Construction	157.34	21.57	-135.77	-89.29%

6 Opportunities

Opportunities should be considered to ensure that the natural environment is left in a better condition than pre-construction conditions for the BVP. This should be achieved by one or both of the following:

- Mitigation: Opportunities to offset the net loss of biodiversity asset(s) and/or natural capital stock(s) (ecosystem service).
- Enhancements: Opportunities that, once introduced and established, would result in a net gain to a biodiversity asset and/or natural capital stock(s) (ecosystem service).

As a core principle, where possible, the BVP should aim to not only reinstate lost habitat, but also provide a greater or more diverse habitat than is lost, to achieve overall BNG. The latter could be achieved by identifying local sites of ecological interest and proposing measures. Any habitats that are created or enhanced to achieve BNG are required to be secured for 30 years, through management, maintenance, and monitoring. The natural capital map which is based on the methodology described in the NECR285 (see Chapter 2) should be utilised, where possible, to assist in identifying opportunities to improve natural capital.

A summary of the potential NCA, BNG mitigation and enhancement measures for each sub-component type of the BVP are outlined in Table 6.1. Further explanation into the potential enhancement measures is provided within this Chapter.

Table 6.1 : Summary of potential net gain mitigation and enhancement opportunities

Option element	Mitigation opportunity	Enhancement opportunity
All option elements	Option layouts to be amended to avoid the permanent loss of high value natural capital assets that once lost, cannot be easily reinstated. Assets include ancient woodland and traditional orchards.	Creation of higher value habitat within grassland, arable and pasture natural capital assets onsite to achieve an increase in Biodiversity Units (BU) and work towards a 10% uplift in BNG.
	Options to identify area for the creation and/or reinstatement of high value natural capital assets, including: Coastal and floodplain grazing marsh Lowland fens Lowland raised bog Reedbeds Blanket bog Hay meadows Dwarf shrub heath Broadleaved, mixed and yew woodland Coniferous woodland Blue space Greenspace	Habitat creation work within the adjacent priority habitats. Options fall within or are in the vicinity of habitat network zones: Habitat restoration-creation Restorable habitat Fragmentation action zone Network enhancement zones 1 and 2 Expansion zone These areas identify specific locations for a range of actions to help improve the ecological resilience for each of the habitats/habitat networks. The options should look to identify habitat network zones and priority habitats within the near vicinity and look to improve/create/restore habitats which would help to work towards increasing

Option element	Mitigation opportunity	Enhancement opportunity
		BU and work towards a 10% uplift in BNG.
	Construction practices to be considered to reduce the amount of clearance required for, especially in areas that include high value natural capital assets (see above for list).	Increase the quality/quantity of freshwater assets, including lakes, ponds located in designated SSSIs, pending detailed assessment of local conditions and available space.
	Directional drilling to be used where possible to avoid loss of high value natural capital assets (see above for list).	Options to identify suitable areas offsite for the creation, enhancement and/or restoration in order to develop off-site net gains, working towards achieving a 10% uplift in BNG.
		Identify areas of local peatland restoration
Option elements located along the canals		Possibly create man-made floating wetland islands, enabling plants and microbes to form and attract wildlife both above and below the water's surface and create biochemical and physical processes to improve things such as water quality.
Wastewater treatment works, abstraction and treatment works, and other option elements that contain above ground infrastructure		Seeding of grassland within footprints of the above ground infrastructure, where possible.

6.1 BNG Unit Purchase

BNG can be achieved via a new statutory biodiversity credits scheme. Credits can be bought by developers as a last resort when onsite and local offsite provision of habitat cannot deliver the BNG required. The price of biodiversity credits will be set higher than prices for equivalent biodiversity gain on the market and are expected to be purchased through a national register for net gain delivery sites. Natural England is in the process of running pilot schemes to provide a practical insight into the implications of the scheme, which is expected to go live spring 2023.

Habitat creation possibilities, other than unit purchase, to support achieving a 10% BNG include:

- On-site: Improve the existing habitats on-site through post construction remediation and replacement of low BNG value habitats with higher BNG value habitats
- Off-site: Purchase suitable areas of off-site land within the local area and/or at a regional scale to offset BNG decrease by improving the existing habitats within the off-site land and/or by replacing existing habitats with higher BNG value habitats.

- On-site and off-site: Improve existing habitats and/or replacement of low BNG value habitats with higher BNG value habitats as part of the catchment management options considered as part of the regional plan process.

It is important that, where possible, the BVP starts to consider reaching out to local non-government organisation and planning authorities who may potentially be able to carry out BNG both onsite and offsite. Early engagement may help provide further insight on local opportunities for enhancement, how this can be achieved, local priorities and limiting factors.

7 Conclusions

The NCA, BNG and ecosystem services outputs of the BVP identified the following:

- NCA: The BVP options will cause the temporary and permanent loss of natural capital stocks. The BVP is likely to cause the permanent loss of ancient woodland and orchards and top fruit stocks, that once lost cannot be replaced. Thames Water should seek to avoid this by diverting routes where possible to avoid this high-value natural capital stock.
- Ecosystem services: The plan presents opportunities to improve the existing habitats along the route through post construction remediation and the replacement of low value habitats with higher value habitats. The potential permanent loss of arable, pastoral, ancient woodland, orchards and top fruit, coniferous woodland, greenspace and active flood plain habitat could result in the permanent loss of several ecosystem services that the stock provides in synergy, including carbon sequestration, natural hazard management, air pollution removal, and food production. The potential permanent loss of arable and pastoral stock could result in the permanent loss of food production. The BVP shows a positive impact on recreation & amenity value ecosystem services, with the provision of services associated with the Abingdon reservoir and in the surrounding areas.
- BNG: The plan is likely to result in a loss of BNG habitat units due to the permanent loss of natural capital assets during construction. Mitigation and enhancement opportunities for the scheme have been suggested within Chapter 4, which can work to better BNG and introducing environmental net gain. Alternatively, credits can be bought by developers as a last resort when onsite and local offsite provision of habitat cannot deliver the BNG required. Thames Water's BVP would require the purchase of 1819.28 units. The price of biodiversity credits will be set higher than prices for equivalent biodiversity gain on the market.

7.1 Next Steps

The opportunities identified in the BNG/NCA for the BVP have the potential to contribute to government ambitions for environmental net gain. This could take the form of habitat compensation, creation and/or species relocation schemes. Any options would need to be taken forward based on a comprehensive understanding on the interaction between natural systems and between natural systems and social uses of land.

As part of finalising the WRMP24, opportunities will be considered to create and improve habitat on-site and off-site through local schemes, NRNs and wildlife corridors in order to achieve a 10% net gain in BNG units and increase the provision of ecosystem services, therefore aiding in developing more resilient options for the future provision of water for the Thames Water region.

Annex A: Natural capital stocks and mapping methodology

Broad Natural Group	Subgroup	Mapping Methodology
Freshwater	Active flood plain	Areas at high or medium risks within the Environment Agency (EA)'s Risk of Flooding from Rivers and Sea dataset.
	Blanket Bog	Area of blanket bog mapped using Natural England's Priority Habitat Inventory.
	Chalk Rivers*	Mapped using the EA chalk rivers dataset and mapping intersections with OS watercourse polygons
	Coastal and floodplain grazing marsh	Area of coastal floodplain and grazing marsh mapped using Natural England's Priority Habitat Inventory
	Lakes and standing waters	Area of lakes and reservoirs mapped using the Centre for Ecology and Hydrology (CEH)'s UK Lakes Portal dataset.
	Lowland Fens	Area of lowland fens mapped using Natural England's Priority Habitat Inventory.
	Lowland raised bog	Area of lowland raised bog mapped using Natural England's Priority Habitat Inventory
	Modified waters e.g., reservoirs	Area of reservoirs mapped by selecting Ordnance Survey (OS) surface water polygons (Vector Map District) that coincide with CEH's Inventory of UK reservoirs (points).
	Other semi-natural habitats	Area of other semi-natural habitat mapped using Natural England's Priority Habitat Inventory (including upland and lowland grasslands, heathland, and saltmarsh).
	Ponds and ditches	Mapped by selecting surface waterbodies (from OS Vector Map District) that do not intersect rivers, are smaller than 2ha in size.
	Reedbeds	Area of reedbed habitat mapped using NE's Priority Habitat Inventory
	Rivers	Length of rivers mapped using EA's Water Framework Directive (WFD) river waterbodies dataset (cycle 1, to include coastal streams
Mountain, Moor and Heath	Blanket bog	Area of blanket bog mapped using Natural England's Priority Habitat Inventory.
	Dwarf shrub heath	Mapped using Natural England's Priority Habitat Inventory ('fragmented heath', 'lowland heathland' and 'upland heathland')
	Inland rock, scree and pavement (AML*)	Area of inland rock and limestone pavement above the moorland line, mapped using CEH's LCM2015 ('inland rock'), Natural England's Priority Habitats Inventory ('limestone pavement') and the Rural Payment Agency (RPA)'s Moorland Line dataset.
	Lakes and Reservoirs	Area of lakes and reservoirs above the moorland line, mapped using CEH's UK Lakes dataset, CEH's Inventory of UK reservoirs dataset and RPA's Moorland Line dataset.

Broad Natural Group	Subgroup	Mapping Methodology
	Mountain heath and willow scrub	Area of mountain heath and willow scrub mapped using Natural England's Priority Habitat Inventory.
	Rivers (AML)	Length of rivers mapped using EA's WFD river waterbodies dataset and RPA's Moorland Line dataset.
	Semi-natural grassland (AML*)	Area of semi-natural grassland above the moorland line, mapped using Natural England's Priority Habitat Inventory and RPA's moorland line dataset.
	Upland flushes fens and swamps	Area of upland flushes, fens and swamps, mapped using Natural England's Priority Habitat Inventory.
	Wood pasture (AML*)	Area of wood pasture above the moorland line, mapped using Natural England's provisional Wood-Pasture and Parkland BAP Priority Habitat Inventory and RPA's Moorland line dataset.
	Woodland (AML*)	Area of woodland above the moorland line, mapped using FC's National Forest Inventory and RPA's moorland line dataset.
Urban	Blue space	Mapped by intersecting OS Vector Map District Surface Water with the Office for National Statistic (ONS)'s Built-Up areas dataset.
	Green space - not semi-natural	Area of urban green space (not semi-natural), mapped using the OS Open Greenspace Layer.
	Open mosaic habitats	Area of open mosaic habitats on previously developed land, mapped using Natural England's draft Open Mosaic Habitat dataset
	Woodland, scrub, and hedge	While urban scrub and hedge are difficult to map at a national scale, the area of urban woodland is mapped here by intersecting FC's National Forest Inventory with ONS Built-Up Areas.
	Semi-natural habitats	Mapped by intersecting Natural England's Priority Habitat Inventory habitats (excluding woodland, good quality semi-improved grassland and traditional orchards) with ONS Built-Up Areas
Farmland	Arable and rotational leys	Area of arable and rotational leys, and horticulture individually, this map shows the area of arable, and horticulture combined. Mapped using UK Land Cover 2018 Sub Classes.
	Horticulture	Area of arable and rotational leys, and horticulture individually, this map shows the area of arable, and horticulture combined. Mapped using CEH's Land Cover Map 2015 (LCM2015).
	Improved grassland	Area of improved grassland mapped using CEH's LCM2015.

Broad Natural Group	Subgroup	Mapping Methodology
	Orchards and top fruit	Area of orchards and top fruit mapped using Natural England's Priority Habitat Inventory ('traditional orchards')
Woodland	Ancient Woodland	Mapped using Natural England's Ancient Woodland dataset.
	Broadleaved, mixed and yew woodland	Mapped using FC's National Forest Inventory.
	Coniferous woodland	Area of coniferous woodland mapped using FC's National Forest Inventory
	Woodland priority habitats	Mapped using Natural England's Priority Habitat Inventory ('deciduous woodland').
Grasslands	Hay meadows	Area of hay meadow mapped using Natural England's Priority Habitat Inventory ('upland meadow' and 'lowland meadow').
	Other semi-natural grasslands	Area of other semi-natural grassland, mapped using Natural England's Priority Habitat Inventory ('upland calcareous', 'lowland calcareous', 'lowland dry acid', 'good quality semi-improved', 'grass moorland' and 'purple moor grass and rush pasture').
Coastal	Beach	Area of beach mapped using OS Vector Map District ('foreshore'). Note that this dataset includes areas of intertidal sediment as well as beaches.
	Coastal lagoons	Area of coastal lagoons mapped using Natural England's Priority Habitat Inventory ('saline lagoons').
	Mudflats	Area of intertidal mudflats mapped using the EMODnet (Natural England) Intertidal Mudflats dataset.
	Salt marsh	Area of saltmarsh mapped using EA's Saltmarsh Extent dataset.
	Sand dunes	Area of sand dunes mapped using Natural England's Priority Habitat Inventory ('coastal dunes')
	Sea Cliff	Area of sea cliff habitat mapped using Natural England's Priority Habitat Inventory ('maritime cliff and slopes').
	Shingle	Area of shingle mapped using Natural England's Priority Habitat Inventory ('coastal vegetated shingle').
Marine	Intertidal rock	Area of intertidal rock mapped using Natural England's Open Marine Evidence Base (EUNIS code A1).
	Maerl beds	Area of maerl beds mapped using Natural England's Open Marine Evidence Base (EUNIS code A5.51).
	Reefs	Area of potential reefs mapped using JNCC's Potential Appendix 1 Reefs
	Sea grass beds	Area of seagrass beds mapped using Natural England's Open Marine Evidence Base (EUNIS code A2.61)

Broad Natural Group	Subgroup	Mapping Methodology
	Shallow subtidal sediment	Area of shallow subtidal sediment mapped using JNCC's UK Sea Map 2018 (biozone = shallow circalittoral or infralittoral and substrate = sediment, sand, or mud).
	Shelf subtidal sediment	Area of shelf subtidal sediment mapped using JNCC's UK Sea Map 2018 (biozone = deep circalittoral and substrate = sediment, sand, or mud).
	Subtidal rock	Area of subtidal rock mapped using JNCC's UK Sea Map 2018 (substrate = rock).
Soils	Nutrient Status of Soil	Mean estimates of total nitrogen concentration in topsoil (0-15cm depth) - % dry weight of soil, mapped using data produced from Natural England and CEH's 'Mapping Natural Capital' project (2016).
	Soil Carbon/Organic Matter	Mean estimates of carbon density in topsoil (0-15cm depth) – tonnes per hectare, mapped using data produced from Natural England and CEH's 'Mapping Natural Capital' project (2016)
	Soil Biota	Mean estimates of total abundance of invertebrates in topsoil (0-8 cm depth), mapped using data produced from Natural England and CEH's 'Mapping Natural Capital' project (2016)
Indicators of condition	Natural Aquifer Function	Area of groundwater catchment with 'good' quantitative status for WFD 2016, mapped using EA's WFD data and groundwater catchment boundaries (C2).
	Naturalness of Flow Regime	The WFD hydrological regime classification describe the naturalness of river flows. This map shows the length of river with 'high' WFD hydrological status in 2016, mapped using EA's WFD data and river water bodies (C2)
	Lack of Physical Modifications of Water Bodies	Lack of physical modification of rivers, mapped using EA's Reasons for Not Achieving Good Status data (SWMI = 'physical modification'), 2013-2016.
	Presence and Frequency of Pollinator Food Plants	Mean estimates of number of nectar plant species for bees per 2x2m plot, mapped using data produced from Natural England and CEH's 'Mapping Natural Capital' project (2016)
	Chemical status of water bodies	River chemical status for WFD 2016, mapped using EA's WFD data and river water bodies (C2)

* The list of natural capital stocks as described in NERC285 have been supplemented with additional abiotic stocks and key habitats that are vital to the Thames Water region.


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